

Eastern Massachusetts National Wildlife Refuge Complex

*Draft Comprehensive Conservation
Plan and Environmental Assessment
Executive Summary*

*Assabet River, Great Meadows and
Oxbow National Wildlife Refuges*

April 2003





This goose, designed by J.N. “Ding” Darling, has become a symbol of the National Wildlife Refuge System

The *U.S. Fish and Wildlife Service* is the principal federal agency for conserving, protecting, and enhancing fish and wildlife in their habitats for the continuing benefit of the American people. The Service manages the 94-million acre National Wildlife Refuge System comprised of 540 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological services field stations. The agency enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

CCPs provide long term guidance for management decisions; set forth goals, objectives, and strategies needed to accomplish refuge purposes; and, identify the Service’s best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.



U.S. Fish and Wildlife Service

Eastern Massachusetts National Wildlife Refuge Complex

Draft Comprehensive Conservation Plan and Environmental Assessment Executive Summary

Vision Statement for the Complex

The Eastern Massachusetts National Wildlife Refuge Complex will contribute to the mission of the National Wildlife Refuge System and support ecosystem-wide priority wildlife and natural communities. Management will maximize the diversity and abundance of fish and wildlife with emphasis on threatened and endangered species, migratory birds, and aquatic resources. The Complex will have a well-funded and community-supported acquisition program which contributes to wildlife conservation. The refuges will be well known nationally and appreciated in their communities. They will be seen as active partners in their communities, school systems, and environmental organizations which will result in high levels of support for the refuges. The refuges will be a showcase for sound wildlife management techniques and will offer top-quality, compatible, wildlife-dependent recreational activities. Refuges open to the public will provide staffed visitor contact facilities that are clean, attractive, and accessible, with effective environmental education and interpretation.

U.S. Fish and Wildlife Service
Northeast Regional Office
300 Westgate Center Drive
Hadley, MA 01035

April 2003

Abstract

Type of Action: Administrative— Development of a Comprehensive Conservation Plan

Location: Eastern Massachusetts National Wildlife Refuge Complex, Massachusetts
Assabet River, Great Meadows and Oxbow National Wildlife Refuges

Lead Agency: U.S. Fish and Wildlife Service

Responsible Official: Dr. Richard O. Bennett, Acting Regional Director

For Further Information: Libby Herland, Project Leader
73 Weir Hill Rd
Sudbury, Massachusetts 01776
(978)443-4661

The Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) describes three alternatives for three of the refuges in the Eastern Massachusetts National Wildlife Refuge Complex (Complex): Assabet River National Wildlife Refuge, Great Meadows National Wildlife Refuge and Oxbow National Wildlife Refuge. Later, we will release a CCP/ Environmental Impact Statement (EIS) for Monomoy, Nomans Land Island and Nantucket national wildlife refuges, and CCP/EAs for Massasoit and Mashpee national wildlife refuges. A brief description of the alternatives in this EA are as follows:

Alternative A. This is the current management alternative required by the National Environmental Policy Act (NEPA). The refuges continue programs they currently have in place. No new efforts are undertaken, and land acquisition occurs only for those parcels already within the approved refuge boundaries.

Alternative B. This alternative represents the U.S. Fish and Wildlife Service Proposed Action; that is, the alternative we recommend for approval. Land acquisition occurs only within the refuge boundaries. This alternative emphasizes inventorying and monitoring refuge resources. This alternative also offers more wildlife observation, photography, environmental education, and interpretation opportunities as well as hunting and fishing on all three refuges.

Alternative C. Alternative C is similar to Alternative A, but places emphasis on a less intrusive management style. Inventory and monitoring of refuge resources would occur, but would be limited. The refuges would support similar programs as existing now, but not expand habitat management programs as Alternative B does. This alternative is distinguished from others by the amount of resources directed towards expanding all priority public use opportunities and active management programs.

The draft CCP/EA also includes appendices that provide additional information supporting our analysis.

Reader's Guide

This executive summary includes highlights from the draft CCP/EA for Assabet River, Great Meadows and Oxbow National Wildlife Refuges. We have literally lifted-out sections of Chapters 1, 2, 4, and 5 for this executive summary, specifically, sections that describe the planning process and the alternatives. This summary does not include Chapter 3, Affected Environment. You can obtain a copy of the full-text version, which includes 500 pages of detailed descriptions, analysis, and supporting documentation for the four alternatives by contacting the Complex headquarters in Sudbury or online at <http://northeast.fws.gov/planning>.

This summary includes an overview of our planning process, describes the Proposed Action (Alternative B,) and compares it to three other possible management alternatives. In addition, the major benefits and consequences associated with each alternative are presented.

The Draft EA/ CCP provides NEPA compliance for the future management of three refuges in the Complex: Assabet River, Great Meadows and Oxbow refuges. Following the release of our final NEPA decision document and Finding of No Significant Impact (FONSI) we will release a stand-alone CCP for each refuge.

We have written Chapter 1 and Chapter 5 to apply to all three refuges. However, each refuge has a separate part or section in the Affected Environment, Alternatives, and Environmental Consequences chapters and in some appendices. In these chapters, Assabet River Refuge is Part 1, Great Meadows Refuge is Part 2 and Oxbow Refuge is Part 3. The CCP will consist of information organized in the following sections of this document:

- **Chapter 1. The Purpose of and Need for Action, Issues and Concerns**
- **Chapter 2. Alternatives**
- **Chapter 3. Affected Environment**
- **Chapter 4. Environmental Consequences**
- **Chapter 5. Consultation with Others**
- **Appendices**

Public involvement and NEPA compliance have been incorporated into the process at all appropriate stages.

The final approved CCP will provide the vision and strategic direction for the refuges. When fully implemented, each CCP will help achieve the refuge's purpose, fulfill the National Wildlife Refuge System (System) mission, maintain or restore the biological integrity, diversity, and environmental health of the Complex, and meet other mandates. It will be adjusted to consider new and better information, ensuring that refuge activities best serve the intended purpose and mission of the System. The CCP will also guide management decisions and set goals, objectives, and strategies to accomplish these ends. We also require step-down management plans to provide additional details about meeting CCP goals and objectives and to describe strategies and implementation schedules. The CCP will be based on the principles of sound fish and wildlife management, available science, legal mandates, and our other policies, guidelines, and planning documents. It will, above all else, ensure that wildlife comes first on the refuges.



Great Blue Heron at Great Meadows National Wildlife Refuge *Photo by Sandy Selesky*

Introduction

- Introduction and Background
- Purpose and Need for a CCP
- Planning Areas
- Vision Statement for the Complex
- Goals for the Complex
- National and Regional Mandates and Plans Guiding this Project
- The Comprehensive Conservation Planning Process and Public Involvement
- Wilderness Review
- Issues Identified Through Public Scoping
- Issues and Concerns Considered Outside the Scope of This Analysis



Yellow warbler. *Photo by Bruce Flaig*

Introduction and Background

This Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) has been prepared for three of the eight refuges of the Eastern Massachusetts National Wildlife Refuge Complex (Complex). These three refuges are Assabet River, Great Meadows (Concord and Sudbury Units), and Oxbow national wildlife refuges.

We will prepare a separate CCP and Environmental Impact Statement (CCP/EIS) for Monomoy and Nomans Land Island national wildlife refuges. CCP/EAs for Nantucket, Massasoit and Mashpee national wildlife refuges will undergo the CCP process at a later date.

Purpose and Need for a CCP

The purpose of a CCP is to provide managers and other interested partners guidance and direction for each refuge over the next 15 years, thus achieving refuge purposes and contributing to the mission of the Refuge System. The plan identifies what role the refuges play, consistent with sound principles of fish and wildlife conservation, in the protection, enhancement and restoration of trust resources.

This plan is also needed to:

- provide a clear statement of desired future conditions for habitat, wildlife, visitors and facilities;
- provide refuge neighbors, visitors, and partners with a clear understanding of the reasons for management actions;
- ensure management reflects the policies and goals of the Refuge System and legal mandates;
- ensure the compatibility of current and future uses;
- review current boundaries of the refuges, and evaluate the need to revise boundaries to better achieve refuge purposes;
- provide long-term continuity and direction for Complex management; and,
- provide a basis for staffing and operations, maintenance, and the development of budget requests.



Marsh wren. *Photo by Bruce Flaig*

Currently, there is no management plan in place for Assabet River, Great Meadows or Oxbow refuges that establishes priorities or provides consistent direction for managing fish, wildlife, habitats, and public uses on these refuges. This plan will help to resolve issues related to control of nuisance and invasive species, public uses in conflict with wildlife needs, lack of opportunities for wildlife dependent recreation, and the needs of our Federal trust wildlife species.

Decision to be Made

Based on the assessment described in this draft document, our Regional Director will select a preferred alternative to fully develop into CCPs for the refuges. The Regional Director's selected alternative could be the Proposed Action, the Current Management Alternative, Alternative C or a combination of actions or alternatives presented. Selection of the preferred alternative will be made based on an evaluation of the Service's mission, the purposes for which the refuges were established, legal mandates, and responses to this Draft CCP/EA. In accordance with NEPA, our Regional Director must also determine whether the selected management alternative will have a significant impact on the quality of the human environment. If there is a significant impact, additional analysis will be required in an EIS. If there is no impact, we will issue a Finding of No Significant Impact (FONSI). Once the Regional Director has signed the FONSI and Decision Memorandum and we have completed stand-alone CCPs for each refuge, we will notify the public in the *Federal Register* and implement the plan.

Planning Areas

The Complex consists of eight refuges located in Massachusetts (Map 1-1). This plan addresses Assabet River, Great Meadows and Oxbow refuges.

- **Assabet River National Wildlife Refuge**, in the towns of Maynard, Sudbury, Stow, and Hudson;
- **Great Meadows National Wildlife Refuge** (Concord and Sudbury Units) in the towns of Concord, Sudbury, Bedford, Billerica, Carlisle, Wayland, Framingham and Lincoln;
- **Oxbow National Wildlife Refuge**, in the towns of Shirley, Harvard, Ayer and Lancaster.

We will discuss Massasoit, Mashpee, Monomoy, Nantucket, and Nomans Land Island refuges in later NEPA documents.

Establishment and History of the Eastern Massachusetts Refuges

National Wildlife Refuge System lands are acquired under a variety of legislative and administrative authorities. Refuges can be established by Congress through special legislation, by the President through Executive Orders, or administratively by the Secretary of Interior who is authorized by Congress through a number of different legislation including: Migratory Bird Conservation Act of 1929, Fish and Wildlife Coordination Act of 1934, Fish and Wildlife Act of 1956, Refuge Recreation Act of 1962, National Wildlife Refuge System Administration Act of 1966, Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1972, Endangered Species Act of 1973, Emergency Wetland Resources Act of 1986, and the North American and the Wetland Conservation Act of 1989. Lands are also acquired through military excess, bequests and donations.

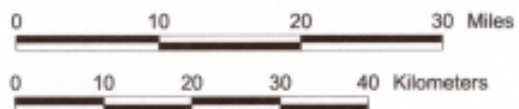
Eastern Massachusetts National Wildlife Refuge Complex

Massachusetts



Data Sources:
USFWS refuge boundaries

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2011. This map is for planning purposes only.



Assabet River National Wildlife Refuge

Formerly known as the Sudbury Training Annex, Assabet River Refuge is the most recent addition to the Complex, created in the Fall of 2000, when Fort Devens Army Base transferred 2,230 acres to the Service. This transfer was made in accordance with the Defense Base Closure and Realignment Act of 1990, with the purpose of having “*particular value in carrying out the national migratory bird management program.*” All acres within the boundary are acquired. The large wetland complex and the contiguous forested areas are important feeding and breeding areas for migratory birds. Under Army administration, the refuge was not opened to general public use; however, hunting, fishing, and interpretive opportunities remain a high priority for local community members.



Canoers on the Concord River.
USFWS Photo

Great Meadows National Wildlife Refuge

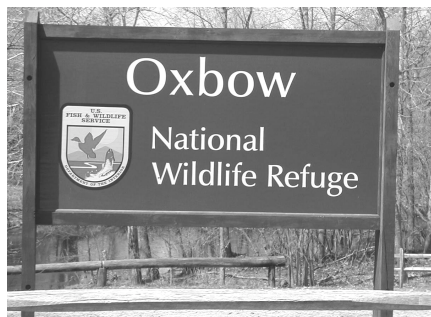
Established in 1944, the Concord impoundments became the first tract of land in the Great Meadows Refuge. The refuge's 3,629 acres extend into eight towns. The refuge was created under the Migratory Bird Conservation Act “*for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*”

The refuge is divided into two units: the Concord Unit (1,492 acres) and the Sudbury Unit (2,137 acres). The Concord and Sudbury units provide habitat for a variety of species. For example, the Concord impoundments are utilized by many migrating waterfowl, shorebirds, wading and marsh birds. The upland areas support woodcock, songbirds, and many raptors. The marsh habitats are utilized by amphibians and reptiles.

Great Meadows Refuge faces a growing problem with invasive species, particularly purple loosestrife, water chestnut and common reed. The refuge has implemented control methods for water chestnut and purple loosestrife in an effort to reestablish a rich diversity of native vegetation.

The visitor center, located at the Complex headquarters in Sudbury, offers interpretive exhibits and educational and interpretive programming for visitors. A walking trail offers visitors wildlife observation and photography opportunities.

Oxbow National Wildlife Refuge



Oxbow Refuge entrance sign.
USFWS Photo

Oxbow Refuge was also formerly part of the Fort Devens base. The two original transfers from the Army in 1973 totalled 711 acres. All acres within the boundary are acquired. The refuge was established for its “*particular value in carrying out the national migratory bird management program*” under an “Act Authorizing the Transfer of Certain Real Property for Wildlife Conservation Purposes Act of May 1948.” In 1999, 836 additional acres along the



Oxbow Refuge. *USFWS Photo*

Nashua River were transferred to the Service after the Fort Devens base closed. Recent acquisitions complete the boundary at 1,667 acres.

Oxbow Refuge protects forested upland, marsh and grassland habitats. The upland habitat is important for migratory song birds, turkey, white-tailed deer and small game mammals. Marshes and ponds along the Nashua River are important habitat for waterfowl and beaver.

A number of recreational activities occur at Oxbow Refuge. Visitors canoe, view wildlife, cross-country ski, fish and in some areas, hunt.

Other Areas Evaluated

Land protection in eastern Massachusetts is a high priority for many communities. As part of the CCP process, we evaluated lands which may be appropriate for Service management or ownership to support refuge purposes. In addition to areas immediately adjacent to the current refuge lands, we evaluated focus areas containing significant and important habitats within eastern Massachusetts. The Service worked intensively with communities, conservation organizations and state agencies to identify significant habitats in eastern Massachusetts for possible protection. In the future, We may look to expand refuge boundaries beyond what is currently protected to include these areas.

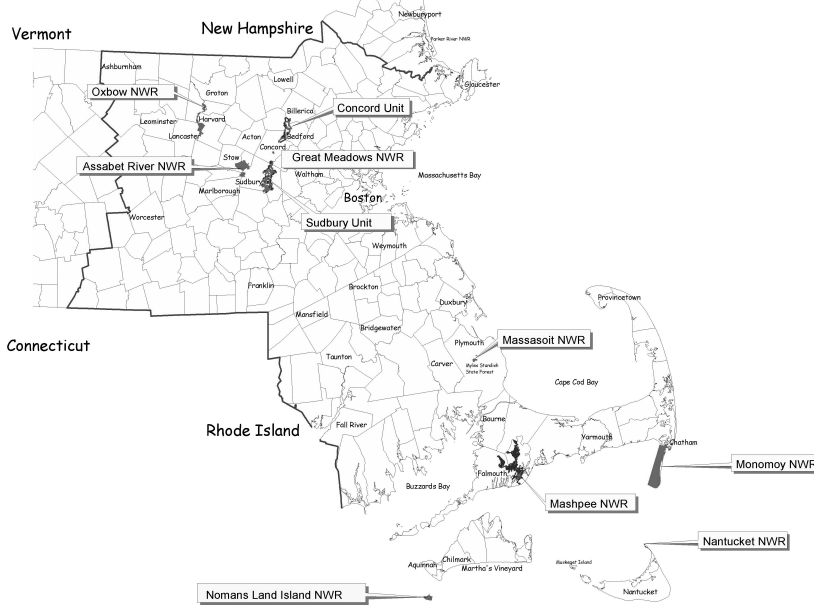
Vision Statement for the Complex

The Eastern Massachusetts National Wildlife Refuge Complex will contribute to the mission of the National Wildlife Refuge System and support ecosystem-wide priority wildlife and natural communities. Management will maximize the diversity and abundance of fish and wildlife with emphasis on threatened and endangered species, migratory birds, and aquatic resources. The Complex will have a well-funded and community-supported acquisition program which contributes to wildlife conservation. The refuges will be well known nationally and appreciated in their communities. They will be seen as active partners in their communities, school systems, and environmental organizations which will result in high levels of support for the refuges. The refuges will be a showcase for sound wildlife management techniques and will offer top-quality, compatible, wildlife-dependent recreational activities. Refuges open to the public will provide staffed visitor contact facilities that are clean, attractive, and accessible, with effective environmental education and interpretation.

Goals for the Complex

The following goals of the Complex support the mission of the Refuge System and the Gulf of Maine Ecosystem Priorities (see section Regional Plans). These goals provide a general management direction for the refuges and will aid in choosing the preferred alternative for management in the final CCP.

Eastern Massachusetts National Wildlife Refuge Complex



Our vision and goals are for all the refuges in the Complex.

1. Recover threatened and endangered species of the Complex.
2. Protect and enhance habitats that support self-sustaining populations of Federal trust species and wildlife diversity.
3. Build a public that understands, appreciates, and supports refuge goals for wildlife.
4. Adequately protect cultural resources that occur in the complex.
5. Maintain a well-trained, diverse staff working productively toward a shared refuge vision.

Using these goals, we will develop a selected management approach in the final CCP. Each goal is supported by objectives identified in the following alternative section with specific strategies and tasks needed to accomplish them. Objectives are intended to be accomplished in a 10-to-15 year time frame. Actual implementation will vary as a result of available funding.

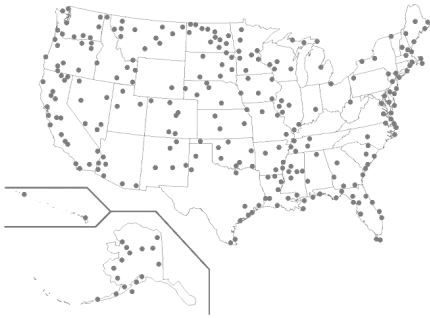
National and Regional Mandates and Plans Guiding this Project

U.S. Fish and Wildlife Service Mission

National Wildlife Refuges are managed by the Service under the Department of Interior. The mission of the Service is:

“...working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.”

The Service has primary responsibility for migratory birds, endangered species, anadromous and interjurisdictional fish, and



The National Wildlife Refuge System.

Our mission is:

“To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

certain marine mammals. These are referred to as Federal trust species. The Service also manages national fish hatcheries, enforces Federal wildlife laws and international treaties on importing and exporting wildlife, assists with State fish and wildlife programs, and helps other countries develop wildlife conservation programs.

The National Wildlife Refuge System Mission

The Refuge System is the world’s largest collection of lands and waters set aside specifically for the conservation of wildlife and ecosystem protection. The Refuge System consists of 538 national wildlife refuges that provide important habitat for native plants and many species of mammals, birds, fish, and threatened and endangered species, encompassing over 93 million acres. Refuges offer a wide variety of recreational opportunities, and many have visitor centers, wildlife trails, and environmental education programs. Nationwide, over 34 million visitors annually hunt, fish, observe and photograph wildlife, or participate in interpretive activities on national wildlife refuges.

In 1997, the Refuge Improvement Act established a unifying mission for the Refuge System, a new process for determining compatible public uses, and the requirement to prepare a CCP for each refuge. The new law states that the Refuge System must focus on wildlife conservation. It further states that the national mission, coupled with the purpose(s) for which each refuge was established, will provide the principal management direction for each refuge.

The Comprehensive Conservation Planning Process and Public Involvement

Given the mandate in the Refuge Improvement Act to develop a CCP for each national wildlife refuge, the Complex began the planning process in 1998. We started by forming a core planning team of refuge staff and regional office planners. We placed a Notice of Intent to prepare an EIS in the January 1999 Federal Register to officially kick-off our planning effort. We assembled existing resource information and developed our vision and preliminary goals. We have also made efforts to involve the public in each stage of our planning process. During the scoping phase, we held open houses and solicited comments through issues workbooks.

Wilderness Review

The planning team conducted a Wilderness Review, as required under the Refuge Planning Policy, to determine if any lands and waters in fee title ownership were suitable to be proposed for designation as a Wilderness Area. During the inventory stage, we determined that none of the three refuges studied in this document fulfill the eligibility requirements for a Wilderness Study Area as defined by the Wilderness Act. Therefore, suitability of the lands for wilderness designation is not analyzed further in this document.

Issues Identified Through Public Scoping

Issues, concerns, and opportunities were brought to the attention of the refuge planning team through early planning discussions with local governments, State, and Federal representatives, and through the public scoping process. We received comments from the public both verbally at open houses and in writing, through Issues Workbooks and individual letters. In addition issues were also identified by the Service. Many issues that are very important to the public often fall outside the scope of the decision to be made within this planning process. In some instances, the Service cannot resolve issues some people have communicated to us. For instance, water quality is a concern that was raised by many people. Proposed refuge management actions will work to improve water quality on the refuge, yet many sources of water pollution originate beyond refuge boundaries and are outside refuge staff ability to affect or change. For this reason, general water quality off-refuge is not analyzed in detail but is listed as a concern raised by the public. We have considered all issues throughout our planning process, and have developed alternative plans that attempt to address the significant issues in different ways where possible.

Habitat and wildlife management.

Many people were interested in our management programs. The Complex has begun additional surveys and inventories to collect baseline information on the all refuges in the Complex. Our efforts at these refuges will help us develop a Habitat Management Plan which will provide a detailed description of our goals and objectives for habitat management on these refuges.

There is a lot of interest in how we manage the freshwater impoundments at Concord, Blanding's turtles at Oxbow and migratory birds and upland habitats on Assabet River, Oxbow and Great Meadows. Additionally, interest was expressed in creating an additional wildlife passage under Route 2 at Oxbow Refuge.

The public is concerned about what will happen with fencing that currently surrounds Assabet River Refuge and how it impacts wildlife movement. The fencing was not removed when the property was transferred to the Service.



Water chestnut harvesting. *In the past, Great Meadows Refuge has harvested water chestnut to help control the spread of this invasive species. USFWS Photo*

Control of invasive, injurious, and overabundant plant and animal species.

Invasive species, including water chestnut, common reed, and purple loosestrife are a concern at Assabet River, Great Meadows and Oxbow refuges. These species limit the productivity of wildlife habitat. Management to control invasive species was mentioned as a watershed-wide priority to some conservation associations.

The refuges continue their efforts to control known invasives on the refuge. At Great Meadows Refuge, we are experimenting with different control techniques.

Hunting

Requests were made at public meetings and through written comments both to allow and not to allow deer hunting on the refuges. We received a petition requesting consideration of bow hunting at Assabet River Refuge. Currently, Oxbow Refuge is the only refuge in the Complex where hunting is allowed. Poaching is a problem on the Sudbury Unit of Great Meadows Refuge. There have been suggestions to provide lawful hunting opportunities on the refuge to control deer populations and deter poaching. Some would like to see waterfowl hunting on the Concord Unit of the Great Meadows Refuge. Cooperation with local towns and hunting groups was a suggestion. Others oppose hunting of any kind on the refuge. Again, there were suggestions both for and against hunting.

Management of public use and access.

The Eastern Massachusetts Refuge Complex Headquarters and interpretive and environmental education center is located in Sudbury, MA. Residents near Oxbow Refuge are anxious to have a visitor center/ education center closer to their refuge. Many people requested a visitor center at Fort Devens in an effort not to build on the refuge itself. Also, the need for environmental educational programs in local schools as well as additional interpretive opportunities where the public can learn about the refuges was also raised.



Public Use. Many identified the need for additional environmental education opportunities on all three refuges. USFWS Photo

Both Great Meadows and Oxbow refuges have high visitation numbers. We estimate use at Great Meadows Refuge to be around 500,000 visitors per year, with the majority of visitors at the Concord impoundments. Oxbow visitation is around 70,000 per year. These numbers are estimates. We do not have a consistent process for collecting and documenting visitation at all sites.

Several non-wildlife dependent recreational activities occur on the all three refuges. Trespass is occurring at Assabet River Refuge. Many visitors use trails at Oxbow and Great Meadows refuges for dog walking, jogging and bike riding.



Pickerel weed and tussock grass.

Photo by Marijke Holtrop

Resource protection and visitor safety

Many people voiced concern for additional protection for cultural and historical resources, particularly at Assabet and Oxbow. Other concerns included the need to control poaching, trespassing and other refuge regulations violations. We need to address use of structures, especially at Assabet River Refuge, where a number of buildings need to be removed.

Infrastructure and Operations and Maintenance

We heard from some people that the Complex doesn't have the resources and staff needed to support programs and maintenance of the refuge.

Issues and Concerns Considered Outside the Scope of This Analysis

Some external threats to the refuges such as water quality and contamination were identified by the public.

Poor water quality in the Concord, Sudbury and Assabet Rivers prompted concern among citizens. The Concord and Sudbury Rivers both are reported to have high levels of contamination. In these watersheds, the Service is currently involved in watershed-wide efforts and partnerships to review and reduce impacts to the communities and to refuge resources. Service contaminants specialists represent wildlife interests in contaminants cleanup efforts that directly affect refuge lands, such as lands transferred to the Service or rivers that flow into the refuges. The clean up of Assabet River Refuge is being monitored by the Service. Some cleanup efforts are the responsibility of other agencies, such as contaminants cleanup from Otis/Edwards Air Force Base on the Cape. Nutrient loading in Waquoit Bay, in Mashpee, is a larger area problem created primarily from sewage management that is beyond the ability of Service employees to solve. Refuge staff or Service specialists are not often involved in such regional efforts.

Before the Army transferred the property to the Service, site contamination surveys were completed. The surveyed areas of the Fort Devens property that contained dangerous levels of arsenic were found and cleaned. However, many people are still concerned with possible contamination in bunkers and other sites on the refuge that have not been surveyed and/or cleaned. Both refuge and Army personnel are examining any possible impacts on the health of the visiting public. The Army has responsibility for the clean-up should additional measures be warranted.

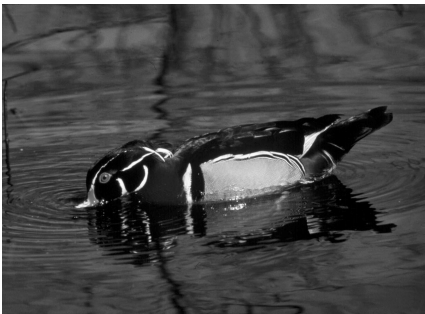
Potential impacts to the local economy and quality of life due to Army base closures.

Portions of two refuges, Oxbow and Assabet River, are lands formerly under Army administration. In towns surrounding these two refuges, people questioned if the surrounding towns would be better off having a refuge as a neighbor or the continued presence of the Army with its population of Fort Devens. There was concern over the potential impact the Army's departure will have on the local community, including the economic effect on stores, restaurants, and other community services. The decision to close Fort Devens has already been made. As a redevelopment site, the population of the Army base is slowly, but not completely, being replaced by employees of the offices and businesses being established in the Devens facilities.

Those lands now administered by the Service will generate revenue sharing payments for the towns in which refuge land is located (see Chapter 2: Introduction, Refuge Revenue Sharing). Under Army administration, the lands comprising Assabet River Refuge were closed to any public access. As a national wildlife refuge, the area may be opened up in part to public access, as safety permits and if compatible with wildlife needs.

Some Towns wish to develop water supply wells on refuge property.

Some towns requested access for the purpose of drilling water supply wells. Wells have been shown to draw down the surrounding water table. A 1994 study by the Massachusetts Office of Water Resources identified that "wells can have a significant impact on nearby (surface) water bodies and may affect specific biological resources." Concerns were raised by the public during CCP scoping that disturbance to wildlife, and other impacts due to the wells, or access to the wells, could occur.



Wood duck. Photo by Bruce Flaig

There is a proposal to expand use of Hanscom Air Field.

MassPort operates Hanscom Air Field, sited in Bedford, Concord, Lincoln, and Lexington. The proposal is to use the airstrip as an auxiliary airport for the Boston Airport, as well as increasing the number of flights per day. The Concord impoundments of Great Meadows Refuge lie directly west of Hanscom's east-west runway. The MassPort plans for expansion of Hanscom may affect wildlife conditions and visitor experience on Great Meadows Refuge. At issue are noise, overflights above a national wildlife refuge, fuel dumping that occurs on landing, water quality, and the concentration of storm water runoff from runways and impervious surfaces. Although the refuge isn't analyzing in detail various alternatives for resolving these issues with Hanscom Field, we support a restriction on volume of air travel to and from Hanscom.

Chemical control of mosquitoes on National Wildlife Refuges nationwide is being evaluated by the Service.

The Service is in the process of developing an EIS for mosquito control on refuges. In 2000, 2001, and 2002 mosquito spraying did not take place on any refuges in the Complex. Great Meadows Refuge is no longer involved in the East Middlesex Mosquito Control Project. Any future Service policy will be applied to Assabet River, Great Meadows and Oxbow refuges.

Jet Skis on the Concord River



Concord impoundments and river.
USFWS Photo

Many residents and the National Park Service spoke against jet skis on the Concord River, particularly with its Wild and Scenic River status. The Massachusetts Department of Environmental Management prohibits the operation of watercraft “in excess of five miles per hour” when the craft is within 150 feet of any channel, tunnel, pier, mooring, wharf, or other floating structure or swimming beach.” (MA State Forests and Parks regulation 304 CMR 12.34). The width of the rivers that flow through the refuges are rarely, if ever, in excess of 150 feet. It is therefore illegal to operate water craft, including jet skis, under State regulations, over five miles per hour within refuge boundaries. Jet skis interfere with wildlife-dependent recreation such as fishing, hunting, and wildlife observation from canoes. Fishing recreationists have frequently complained of jet ski disturbance during their use of the refuge. Some have suggested that this problem could be countered with better patrolling by the refuge.



Eastern bluebird. *Photo by Bruce Flaig*

Alternatives

- Formulating Alternatives
- Features Common to All Alternatives
- Features Common to All Action Alternatives (B & C)
- Alternatives or Actions Considered, but Eliminated From Further Evaluation

Part 1: Assabet River National Wildlife Refuge

- Alternative A: Current Management
- Alternative B: Proposed Action
- Alternative C
- Alternative Matrix

Part 2: Great Meadows National Wildlife Refuge

- Alternative A: Current Management
- Alternative B: Proposed Action
- Alternative C
- Alternative Matrix

Part 3: Oxbow National Wildlife Refuge

- Alternative A: Current Management
- Alternative B: Proposed Action
- Alternative C
- Alternative Matrix



Refuge staff assist students with environmental education project.
USFWS Photo

Formulating Alternatives

Alternatives are packages of complementary management strategies and specific actions for achieving the missions of the Refuge System and the Service, the vision and goals of the Complex, and the purpose for establishing each refuge. Primarily, they propose different ways of responding to key issues, and secondarily, different ways of dealing with the other issues, management concerns, and opportunities identified during the planning process. While those elements underlie every alternative, each is distinguished by its intensity and timing in committing the resources necessary to achieve desired future conditions.

One of our primary objectives is to clearly define the differences among the alternatives. At the end of each part of this chapter, you will find a matrix that compares and contrasts the alternatives by their specific management actions and strategies in tabular format (Tables 2-4, 2-6 and 2-8). We organized the matrix to associate actions and strategies with their function in addressing key issues.

Features Common to All Alternatives for All Refuges

This chapter describes current management and two alternatives for each issue identified in Chapter 1. We describe refuge specific actions in Parts 1, 2 and 3 of this chapter. In order to be concise and eliminate repetition, we have described actions that are common to all alternatives, including the Current Management Alternative, for all refuges in this beginning section. These issues are not reevaluated in later sections of the document.

Fire Management

U. S. Department of the Interior and Service policy state that Refuge System lands with vegetation capable of sustaining fire will develop a Fire Management Plan (FMP) (620 DM 1.4B; 621 FW 1.1.1). The FMP, which includes Great Meadows, Assabet River, and Oxbow refuges, provides direction and continuity in establishing operational procedures to guide all fire management objectives as identified in the plan. This plan was finalized in March of 2003. The FMP includes descriptions of the refuges and addresses wildland and prescribed fire events. The FMP also defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a service-wide requirement that refuges with burnable vegetation develop a FMP (620 DM 1).

The FMP provides a description of the purpose and need for the project, a brief background, the features of each alternative, the

affected environment, and resulting effects and consequences of each alternative. The selected alternative, “prescribed fire and wildland fire suppression” is discussed in detail in the EA.

If you would like a copy of the FMP, or the EA, please contact the Refuge Headquarters in Sudbury.

Land Protection

The Service is currently working on a new national land conservation policy and strategic growth initiative. This policy will develop a vision and process for growth of the Refuge System, helping individual refuges better evaluate lands suitable for inclusion in the Refuge System. The process will help insure that lands the Service protects are of national and regional importance and meet certain nationwide standards and goals. Also, some of the focus of reevaluating Refuge System growth has come from the need to address nationwide operations and maintenance (O&M) backlogs on existing properties. Many refuges, including Assabet River, Great Meadows and Oxbow, are not fully staffed under current budgets and have significant O&M backlogs. Expanding boundaries creates a need for additional staff, O&M funds, as well as additional dollars for the land protection itself. Our Director has asked that we focus, in the interim, on acquiring inholdings within already approved boundaries, which is our proposal under all alternatives for these three refuges.

In the future, we may look at wetland, upland and river systems near Assabet River, Oxbow and Great Meadows refuges which are of interest for possible private-lands habitat improvement projects, easements, and/or acquisition. In particular, we believe protection of lands associated with the Sudbury, Assabet and Concord River watershed are important for the health of fish and wildlife on the refuge. We will continue to protect and acquire lands within the present acquisition boundary at Great Meadows. All lands within the Assabet River and Oxbow refuge acquisition boundaries are already acquired.

Property Taxes, Refuge Revenue Sharing, Relocation, and Landowner Rights

The Refuge Revenue Sharing Act of June 15, 1935, as amended, provides annual payments to taxing authorities, based on acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from Congressional appropriations. The Congressional appropriations are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing Payment does vary from year to year, because Congress may or may not appropriate sufficient funds to make full payment.

Table 2-1. Revenue Sharing Payments for Towns Associated with Assabet River, Great Meadows and Oxbow National Wildlife Refuges

Assabet River		Hudson	Maynard	Stow	Sudbury
	2001	\$863	\$15,395	\$21,286	\$10,179
	2000	\$846	\$15,083	\$20,854	\$9,972
	1999	N/A	N/A	N/A	N/A
Great Meadows		Bedford	Billerica	Carlisle	Concord
	2001	\$10,181	\$2,988	\$10,839	\$5,853
	2000	\$7,796	\$1,743	\$1,804	\$11,283
	1999	\$8,887	\$622	\$2,056	\$12,862
		Lincoln	Sudbury	Wayland	
	2001	\$174	\$29,331	\$26,806	
	2000	\$134	\$23,421	\$18,196	
	1999	\$153	\$26,699	\$20,641	
Oxbow		Ayer	Harvard	Lancaster	Shirley
	2001	\$1,023	\$17,328	\$7	\$833
	2000	\$1,002	\$5,193	\$7	\$816
	1999	\$1,136	\$5,939	N/A	\$927

Accessibility

Each refuge will operate its programs or activities so that when viewed in its entirety, it is accessible and usable by disabled persons. The Rehabilitation Act of 1973, as amended, requires that programs and facilities be, to the highest degree feasible, readily accessible to, and usable by, all persons who have a disability.

Protection and Management of Cultural Resources

The Service has a legal responsibility to consider the effects its actions have on archeological and historic resources. Under all alternatives, we will comply with Section 106 of the National Historic Preservation Act before conducting any ground disturbing activities. Compliance may require any or all of the following: State Historic Preservation Records survey, literature survey, or field survey.

Special Use Permits and Memorandum of Understanding and Agreement

Guided tours, by outside groups, are permitted on the refuges if the activity is determined to be appropriate and compatible with the refuge(s) purpose. Permitting will be divided into four categories by the type of use and the regularity of the activity requested. Where appropriate one Permit or Agreement will be developed for all three northern refuges in the Complex including Oxbow, Assabet River and Great Meadows.



Cattails at Assabet River Refuge.

Photo by Marijke Holtrop

Volunteer Opportunities and Educational Programs

As the Assabet River, Great Meadows and Oxbow refuges continue to contribute to the quality of life in east-central Massachusetts, strong support in the community and the region will also continue to contribute to its success. Helping hands are needed for program development, data gathering, and other opportunities discussed in these alternatives. Only with this type of assistance can the refuge fully achieve its goals and objectives, support the missions of the Refuge System and the Service, and help meet the needs of the community.

The volunteer program at the Complex has been growing steadily. In 1990, volunteers provided more than 3,435 hours of assistance to the Refuge Complex. In 2000, volunteers provided 20,675 hours of service. The total for 2001 was 25,432. Six thousand of those hours were at Assabet River, 5,870 at Oxbow and 2,641 at Great Meadows. Much of this volunteer work was done by core volunteers and active Friends Group members. In 2002, we again received incredible support from volunteers. We are deeply indebted to all of our volunteers for their dedication and services rendered for the betterment of our nation's natural resources.

Research

The Service encourages and supports research and management studies on refuge lands that improve and strengthen natural resource management decisions. The refuge manager encourages and seeks research relative to approved refuge objectives that clearly improves land management, promotes adaptive management, addresses important management issues or demonstrates techniques for management of species and/or habitats. Priority research addresses information that will better manage the Nation's biological resources and is generally considered important to: Agencies of the Department of Interior; the U.S. Fish and Wildlife Service; the National Wildlife Refuge System; and State Fish and Game Agencies, or important management issues for the refuge.

We will consider research for other purposes, which may not directly relate to refuge specific objectives, but may contribute to the broader enhancement, protection, use, preservation and management of native populations of fish, wildlife and plants, and their natural diversity within the region or flyway. These proposals must still pass the Service's compatibility policy.

All researchers on refuges, current and future, will be required to submit research proposals which include a detailed research proposal following Service Policy FWS Refuge Manual Chapter 4

Section 6. All proposals must be submitted at least three months prior to the requested initiation date of the project. Special Use Permits must also identify a schedule for annual progress reports. The Regional Refuge biologists, other Service Divisions and State agencies may be asked to review and comment on proposals.

Monitoring and Adaptive Management

The Final CCP will cover a 15-year period. Periodic review of the CCP will be required to ensure that established goals and objectives are being met, and that the plan is being implemented as scheduled. To assist this review process, a monitoring and evaluation program would be implemented, focusing on issues involving public use activities, and wildlife habitat and population management.

Features Common to All Action Alternatives (B and C) for All Refuges

These are actions common to all action alternatives (B and C). While some of these actions occur under current refuge management, we have described additional steps or actions we would take under Alternative B or C in this section.

The Compatibility Determination

Federal law and Service policy provide the direction and planning framework to protect the System from incompatible or harmful human activities, and to insure that Americans can enjoy Refuge System lands and waters. The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), is the key legislation regarding management of public uses and compatibility. The compatibility requirements of the Refuge Improvement Act were adopted in the Service's Final Compatibility Regulations and Final Compatibility Policy published October 18, 2000 (Federal Register, Vol. 65, No. 202, pp 62458-62496). This Compatibility Rule changed or modified Service Regulations contained in Chapter 50, Parts 25, 26 and 29 of the Code of Federal Regulations (USFWS 2000c). To view the policy and regulations online, go to <http://policy.fws.gov/library/00fr62483.pdf>.

The Act and Regulations require that an affirmative finding be made of an activity's "compatibility" before such activity or use is allowed on a national wildlife refuge. A compatible use is one, "...that will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge" (Refuge Improvement Act). Six priority, wildlife-dependent uses that are to be considered at each refuge are defined in the Act and Regulation. These are: hunting, fishing, wildlife observation and photography, environmental education and interpretation. These priority, wildlife-dependent uses may be authorized on a refuge when they are compatible (as defined above), and not inconsistent

Table 2-2. *Summary of Compatible Uses on Assabet River, Oxbow, and Great Meadows National Wildlife Refuges.*

Wildlife Dependent Recreational Activities and Other Compatible Uses	Assabet River National Wildlife Refuge		Great Meadows National Wildlife Refuge		Oxbow National Wildlife Refuge	
	Existing Activity	Allowed Under Alt. B	Existing Activity	Allowed Under Alt. B	Existing Activity	Allowed Under Alt. B
Wildlife Observation	No	Yes	Yes	Yes	Yes	Yes
Wildlife Photography	No	Yes	Yes	Yes	Yes	Yes
Environmental Education	No	Yes	Yes	Yes	Yes	Yes
Environmental Interpretation	No	Yes	Yes	Yes	Yes	Yes
Hunting- Small game and upland birds	No	Yes*	No	No	Yes	Yes*
Hunting - woodcock and waterfowl	No	Only after surveys	No	Yes*	woodcock only	Yes* (waterfowl on river only)
Hunting-deer	No	Yes*	No	Yes* (archery only)	No	Yes*
Fishing-pond	No	Yes*	No	No	N/A	N/A
Fishing -river	N/A	N/A	Yes	Yes	Yes (from boat & bank)	Yes
Natural history tours	Yes	Yes	Yes	Yes	Yes	Yes
Cultural history tours	Yes	Yes	N/A	N/A	N/A	N/A
Snowshoeing and cross country skiing (to facilitate wildlife dependent uses)	No	Yes	Yes	Yes	Yes	Yes
canoeing (to facilitate wildlife dependent uses)	No	Yes	Yes (on the river only)	Yes (on the river only)	Yes	Yes

*Please refer to the maps for Alternative B for specific locations where these activities are proposed.

with public safety. Not all uses that are determined compatible may be allowed. The refuge has the discretion to allow or disallow any use based on other considerations such as public safety, policy and available funding. However, all uses that are allowed must be determined compatible. Except for consideration of consistency with State laws and regulations as provided for in subsection (m) of the Act, no other determinations or findings are required to be made by the refuge official under this Act or the Refuge Recreation Act for wildlife-dependent recreation to occur. (Refuge Improvement Act).

We have also determined several modes of travel to be compatible. These are: walking or hiking, snowshoeing, canoeing, and cross-country skiing. All of these means of locomotion are subject to compatibility determinations for these activities as part of this CCP. The compatible uses for Assabet River, Great Meadows, and Oxbow refuges are summarized in Table 2-1.

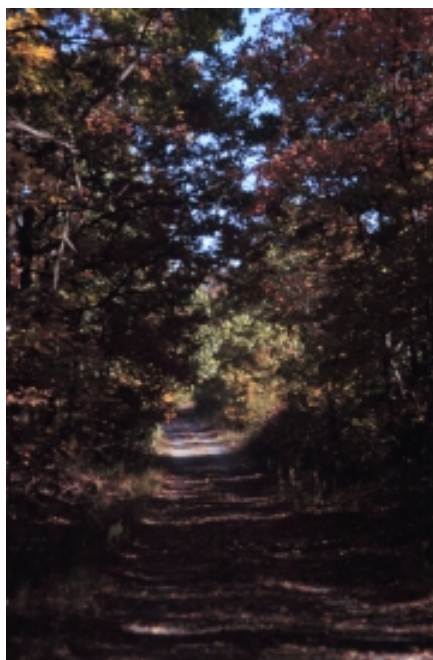
In addition, we have evaluated several other methods of locomotion (specifically, use of motor-vehicles in general, all-terrain vehicles, dirt bikes, gasoline-powered motor boats, snowmobiles, dogsleds, bicycles, and horses). Each of these has been determined to be incompatible with the purpose for which the refuges were established (additional information regarding these uses is provided in this chapter under section Alternatives or Actions Considered, but Eliminated from Further Consideration).

Wildlife and Habitat Management

Assabet River, Great Meadows and Oxbow refuges are currently managing their lands for wetland species, forest dwellers and those species requiring grassland, wetland and old field habitat. However, due to the relatively small land base we have, it is important for us to consider how we can best contribute to the overall picture of trust species of the Atlantic flyway. The Northeast Region of the Refuge System is currently working on a region-wide strategic plan to establish management goals for refuges which address landscape concerns and needs. We are currently gathering data, as described in Alternative A, to better understand the role these refuges for these species and under Alternative B we propose additional surveying, monitoring and researching of our lands. This information is essential for determining our management focus. Using this information and guidance from the regional strategic plan we will draft a Habitat Management Plan for each refuge which outlines the direction and details of refuge management. The Habitat Management Plan will include information required under the Service's Biological Integrity, Diversity and Environmental Health Policy, including discussion of historic conditions and restoration of those conditions if possible (see <http://policy.fws.gov/601fw3.html> to view this policy).

New Recreational Fees

Under Alternatives B and C, the Complex would charge an entrance fee at Assabet River and Oxbow refuges and at the Concord impoundments at Great Meadows Refuge, and a user fee for hunting on the Complex. Our fee program would be established under the Recreation Fee Demonstration Program, a program which Congress initiated in 1997 to encourage Department of Interior agencies who provide recreational opportunities to recover costs for their public use facilities, improve visitor facilities, promote activities for visitors and address the maintenance backlog of visitor service projects (USFWS 1997a). The Program is authorized through 2004 at which time Congress will evaluate its success and either make it a permanent part of the Recreation Fee Program on our National lands or revise the Program. The Program requires at least 70% of revenue remain at the collection site. Currently, 80% of the funds raised from user fees on a particular refuge in this region stay at the refuge. The other 20% is sent to the region to be distributed to other refuges. Great Meadows Refuge has received money from these regional funds in previous years for public use facilities. If the program does become permanent, the percent of revenue remaining on site could change, however it would never be less than 70% and could be as much as 100%. Visitors with a current duck stamp, Golden Eagle Pass, Golden Age Pass or Golden Access Pass do not have to pay entrance fees. For more information on the Recreation Fee Demonstration Program visit <http://www.ios.doi.gov/nrl/Recfees/RECFEE.HTM>.



Proposed trail at Assabet River NWR.
USFWS Photo

The following fee program would be initiated at Great Meadows and Oxbow refuges and at Assabet River Refuge after it is opened.

- A one day access fee will be charged by car or per group if arriving via foot or bicycle. Our proposed fee would be \$4 per day.
- An annual pass for three refuges in the Complex (Assabet River, Great Meadows and Oxbow) would be available for \$20.
- All entrance fees will be collected by refuge staff stationed on site or at self-service fee collection stations.
- An annual fee of \$10 for small game and upland game bird hunting, \$15 for deer hunting or a combined \$20 fee for all hunting seasons open on the refuge would be charged. One permit would be valid for any of the refuges in the Complex that are open to hunting. Hunting fees will be paid when the permit is issued. A hunter, with a valid hunt permit, would not have to pay an entrance fee.

We may adjust fees over the 15 year period addressed in this plan to reflect changes in administrative costs or management goals.



Welcome sign. *USFWS Photo*

Hunting and Fishing

The following discussion is applicable to all alternatives proposing hunting. For the description of the proposed hunting areas, see Parts 1, 2, and 3 of this chapter.

A Hunt Plan will be completed following the final NEPA decision and approval of this CCP. NEPA compliance will be met with this document, however any necessary, refuge-specific regulations or restrictions will be described in the Hunting or Fishing Plan, disseminated through refuge hunting brochures, news releases, and on-refuge informational signing and published in the Federal Register for additional comment and review.

The refuge weighs a number of factors in opening an area to hunting or fishing, including visitor safety considerations. Under the Proposed Action and Alternative C, the Refuge Manager may, upon annual review of the hunting program, impose further restrictions on hunting and fishing activity, recommend that the refuge be closed to hunting or fishing, or further liberalize hunting or fishing regulations within the limits of State law. Restrictions would occur if hunting or fishing becomes inconsistent with other higher priority refuge programs or endangers refuge resources or public safety.

Annual permits would be required for hunting on the refuge. The permits will facilitate managing numbers of hunters and harvest. Fees charged for these permits would offset costs associated with managing hunting programs. For additional information on the fee program, see previous section on New Recreational Fees.

Providing hunting and fishing opportunities addresses the mandates of Executive Order 12996 and the Refuge System Improvement Act of 1997 by providing the public with an opportunity to engage in wildlife-dependent recreation. Hunting and fishing are recognized by the Service as traditional forms of wildlife related outdoor recreation. We anticipate a low to moderate degree of hunting and fishing pressure to occur as a result of opening the refuge for these activities. The plan to permit hunting and fishing on the refuge should not significantly affect the wildlife populations in Massachusetts, as the refuges represent only a very small portion of the overall habitat available in Eastern Massachusetts.

Enforcement of federal and state hunting and fishing regulations will be accomplished through patrols by refuge law enforcement officers. Enforcement patrols may also be conducted by State Conservation Officers. The frequency of patrols will be determined by hunter use, the level of compliance observed during patrols, and information obtained from participants, visitors and other sources. Refuge brochures and hunter orientation prior to the hunting seasons will emphasize refuge specific regulations, safety considerations and the protection of wildlife species found on the refuge.

Alternatives or Actions Considered, but Eliminated From Further Evaluation

Proposals for new, non-wildlife-dependent public uses

During our scoping process, we received requests for a number of recreational opportunities that are not wildlife dependent. These activities include horseback riding, biking, model airplane flying, snowmobiles, all-terrain vehicles, dog sled pulling, ice skating, picnicking, jogging and dog walking. Biking and ice skating were previously allowed, but were eliminated in the late 1990's. Service policy, as well as the Refuge Improvement Act, states that incompatible or non-wildlife dependent recreation will be eliminated as expeditiously as practical, with few exceptions. Our Refuge Manual specifically states that, with few exceptions, these uses will be de-emphasized and gradually phased out. Following public review and comment, the Service published our Final Compatibility Policy in *Federal Register* Volume 65, No. 202, pp 62484-62496 (603 FWM2) on October 18, 2002. This final rule provides additional detail on our process for determining which activities are compatible with a refuge's establishment purpose and management goals. This draft does not evaluate new proposals for these uses because their establishment would contradict Service policy, the purposes for which the refuges were established (see previous section, The Compatibility Determination).

Non-wildlife dependent recreational uses currently allowed at Great Meadows and Oxbow refuges, such as dog walking, jogging and picnicking, are addressed in Parts 2 and 3 of this chapter. Assabet River Refuge, which is currently closed, is not evaluating opening the refuge to non-wildlife dependent public uses for reasons stated above.

Deer Management Options

Reproductive Intervention (birth control)

Reproductive intervention or birth control is the general category for a number of fertility control methods available, each with varying rates of success. Immunocontraception with porcine zona pellucida (PZP) vaccine injection, is probably the best known and most widely applied. Steroid implantation has been available since the 1970s. Remote prostaglandin injection (Denicola 1997), oral vaccination with a live vector (Miller et al. 1999a), and vaccines are more recent and lack long-term evaluation of effectiveness. Sterilization is a permanent option, although not widely applicable.

Effectiveness and efficiency of any of the above forms of reproductive intervention is affected by a number of factors including; method of application or delivery, need or ability to capture the animal, the number of treatments needed to ensure effectiveness, size of the population, status of the population (confined or free ranging), and longevity of treatment.

Immuncontraception

Immuncontraception (PZP injection) is most effective at preventing pregnancy when hand injected and combined with subsequent boosts. The PZP vaccination produces reversible infertility lasting 1-4 years (Miller et al. 1999b), however, it requires two injections, four weeks apart, to be effective for at least two years (McShea et al. 1997). Effectiveness at reducing population number and growth rate is greatly reduced when dealing with large and open populations due to the need to treat a large percentage of the females over a large area. For a large population, contraception rates of less than 50% of does will curb growth in 30 years, but will not reduce the size. Even rates of greater than 50% require at least a 5-10 year planning horizon to see significant population declines (Seagle and Close 1996). Therefore, the cost, effort, expertise, manpower, and handling time will continue for years before achieving any results.

Another obstacle to PZP immuncontraception is the adjuvant used for the initial injection (an adjuvant is a microbial aid necessary for boosting the vaccine once inside the animal's bloodstream). Complete Froine's, the most commonly used, contains heat-killed tuberculin cells, which causes subjects to test false positive for TB. The FDA, which has jurisdiction over its commercial use, currently does not permit use of this adjuvant on other than tightly controlled or isolated populations and in combination with ear-tagging (in order to prevent the public from consuming escaped deer). There are two other adjuvants undergoing field tests but both are not yet effective as boosters and still pending FDA approval (Rick Naugle, Humane Society of the U.S., August 28, 2000, personal communication).

Steroidal implants

Subcutaneous steroidal implants have been used during the past 25 years with varying rates of effectiveness in reducing deer pregnancy (and now remote delivery of this treatment is possible) but the long-term effectiveness is uncertain. In addition, the same factors that confound the PZP method at the population level apply (Connecticut Department of Environmental Protection, Wildlife Bureau, 1988). Because of the uncertainty of long-term health effects on deer and subsequent impacts on the food-web (including human consumption of treated deer), the FDA will not approve application on free-ranging deer at this time (DeNicola et al. 2000).

Oral Delivery of Contraceptives

Oral delivery of contraceptives has a number of concerns that make this method ill-advised and impractical: it is not species-specific (risks ingestion by non-target species), bait and supplies are wasted on non-target species, deer sometimes reject treated bait, and it is difficult to manage dosage control. Currently, the method is not working at the field or captive level. Oral vaccinations through live-vector delivery is a relatively new method, and is species-specific, but is not long-acting and so must be delivered on a frequent and regular basis (Alan Rutberg, Humane Society of the U.S., 2000).

GNRH Vaccine

Another field method currently being tested is the GNRH vaccine. This shuts down the whole reproductive hormone system of both sexes and its effects are dramatic, even on behavior and antler development. This is a new method and the affect on deer and their behavior needs further evaluation prior to application in the field (Ibid.).

Sterilization

Sterilizations must be done annually, the number of which must be calculated based on the number of fertile females in the herd. Great care must be taken to reduce the number of sterilizations in time to prevent a population crash and bottleneck (Boone and Wiegert 1994). Again, this option is not effective for open populations unless performed at a landscape level.

No matter which birth control method is used, more than 50% of the females will need to remain infertile to effect a reduction in population size (Hobbs et al. 2000, Seagle and Close 1996). All of the above described techniques are compromised at the individual and population levels due to the openness of the population. Because these operations entail multiple captures, considerable handling time, facilities for holding captured animals or conducting surgery, risk to personnel and animals, trauma losses, and constant or recurring expense means that at this stage of development they are not viable methods in the field. This situation may change in a few years as applications of these techniques are improved upon.

Live Trapping and Relocation

The live trapping and relocation approach entails transporting captured animals to a new location outside the impacted area. Disadvantages, however, far outweigh the advantages. Capture and handling of deer involves risk to deer and handlers. Deer are susceptible to capture myopathy, a form of muscle dysfunction that is stress-related and can result in delayed mortality. Trauma losses can amount to about 4% of capture and transfer efforts (Wildlife Information Publication, Virginia Department of Game and Inland Fisheries, 1999). The mortality potential attendant to handling is amplified by placing individuals in unfamiliar surroundings (Cypher and Cypher 1988).

Habitat Management

This approach manipulates the existing habitat to induce behavioral changes in deer and reduce human/deer conflicts. An example would be to lower the biological carrying capacity by removing forage species, and/or changing landscape elements such as water features or forest edge. This alternative has an appeal for its humane and nonlethal approach but is incompatible with one of the primary management goals for the refuge, which is to promote and maintain its grassland habitat and vegetation cover.

Part 1: Assabet River National Wildlife Refuge

Alternative A – Current Management

The Current Management Alternative represents the anticipated baseline of the refuge (and associated resources) if current policies, programs and activities continue in a manner consistent with recent or foreseeable trends. While this alternative does not represent a true “status quo” condition, neither does it propose major changes in public use/wildlife management programs or facilities.



A beaver's work on the refuge.
USFWS Photo

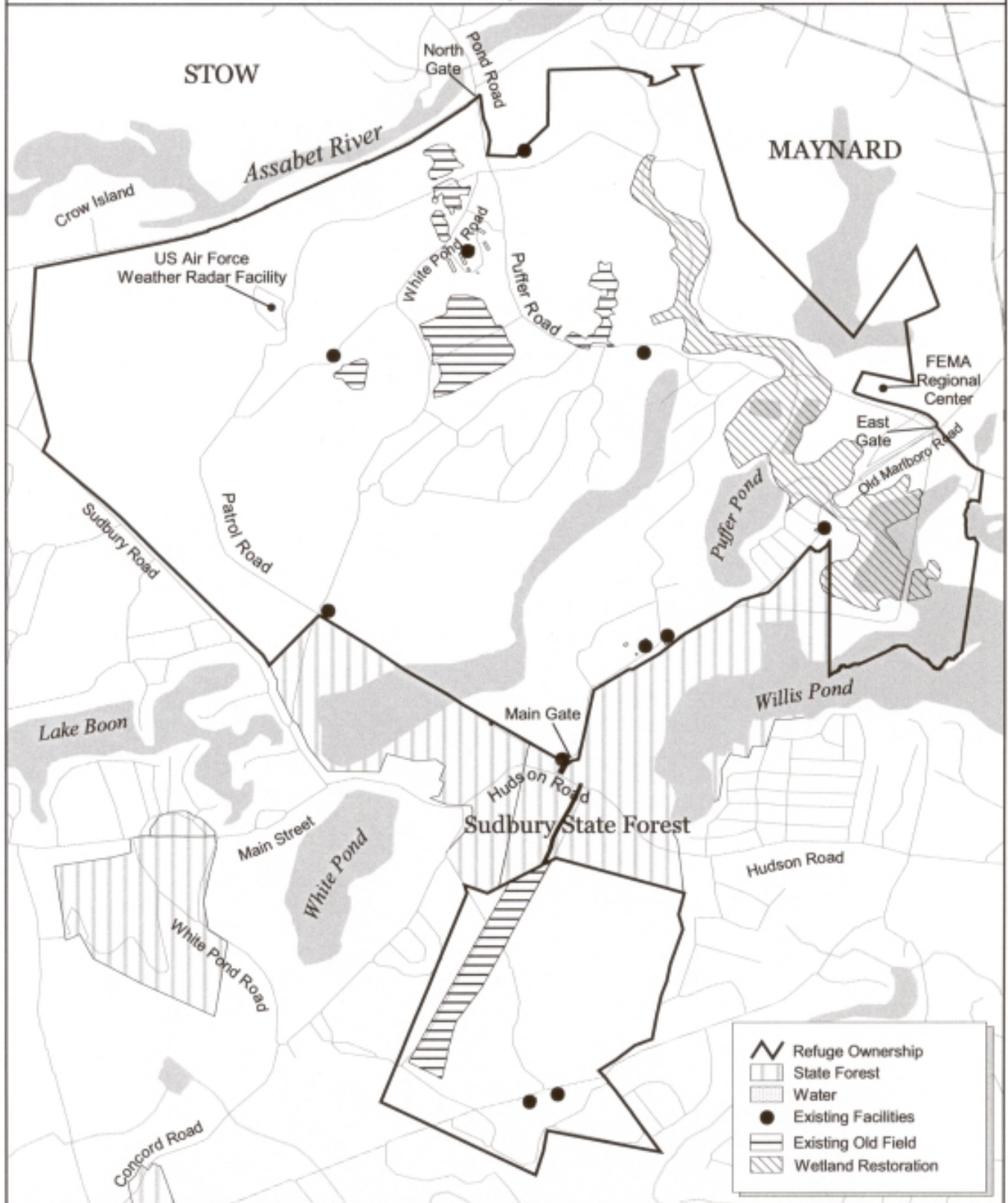
Under this alternative, baseline population surveys of American woodcock, marsh birds, breeding lands birds and anurans will generate sufficient information to document trends among these species and groups. Up to seventy acres of grassland/shrub habitat will be maintained and fifty acres of degraded wetland habitat will be restored. Otherwise, the land will be left alone and allowed to evolve to various wildlife habitat types. Surrounding communities will continue to benefit from ecological functions provided by protected lands, such as watershed values. Continued closure of the land to public access, much as it was during military ownership, may deprive area residents and potential visitors of opportunities to enjoy nearby and unique outdoor recreation and hands-on environmental education experiences. The refuge would continue operations and maintenance activities within its current staffing and funding levels and the refuge boundary would remain at 2,230 acres.

Alternative B – The Proposed Action

Under the Service's Proposed Action, refuge staffing and funding levels would be increased. We would initiate new wildlife population, habitat and invasive/overabundant species management activities and provide new compatible wildlife-dependent recreational opportunities. We would also work with State, Federal and non-governmental partners to secure funding for the construction of new visitor facilities and a visitor contact station to support the goals and objectives of the Refuge System and the Assabet River Refuge.

Special emphasis would be placed on obtaining baseline data of wildlife populations and habitat conditions required to develop the detailed step-down plans under this CCP. Wildlife population and habitat monitoring surveys and inventories would be continued to provide the data needed to assess the effectiveness of management programs and practices, and to make mid-course adaptations to these practices to ensure they meet long-range refuge goals and objectives.

Alternative A: Current Management
Existing Habitat Management and Facilities
Assabet National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

0 1000 2000 3000 4000 5000 Feet

0 250 500 750 1000 1250 1500 Meters





Assabet NWR. *Puffer Pond.* USFWS
Photo

Our Proposed Action for habitat and wildlife management includes four parts:

1. Collect information for all species on the refuge,
2. Determine resources of concern based on national and regional Service plans,
3. Using information gathered in Steps 1 and 2, develop a Habitat Management Plan,
4. Develop a Habitat and Wildlife Inventory and Monitoring Plan to insure objectives in the Habitat Management Plan are reached.

Special emphasis would also be placed on providing enhanced, but sustainable opportunities for the six priority, wildlife-dependent public uses defined in the Refuge Improvement Act of 1997. Public use evaluations, along with wildlife and habitat monitoring programs, would assist us in both assessing the intensity of public use and adapting our management strategies and practices for those uses.

Brief explanations of the Service's Proposed Action follow. The Proposed Action(s) are also summarized in **Table 2-4. *Actions and Strategies Matrix for the Assabet River NWR.***

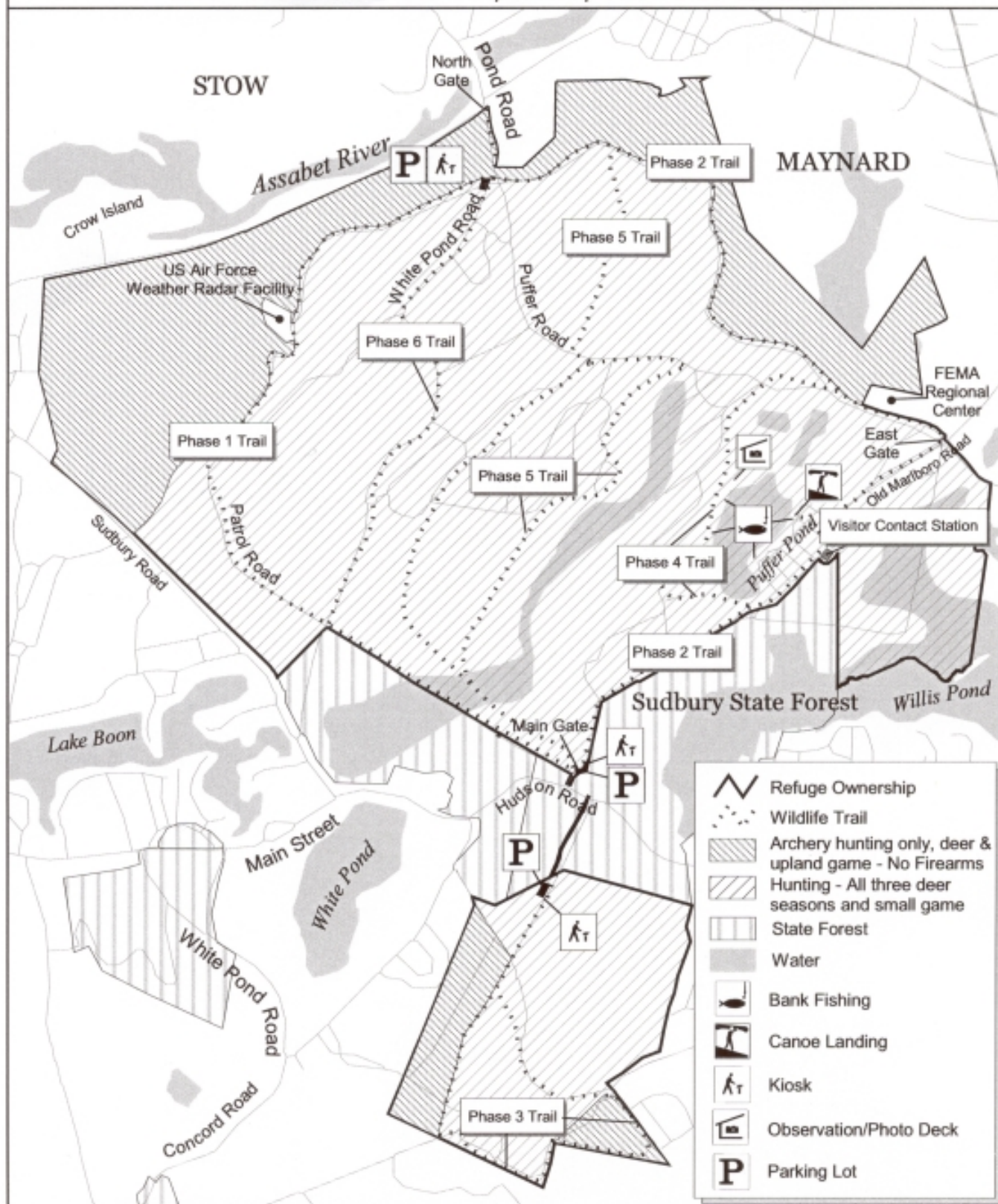


Milkweed. Photo by Marijke Holtrop

Alternative C

Under this alternative the refuge management strategy would be oriented towards a “hands-off, let nature take its course approach.” We would curtail or forego most, active wildlife and habitat management planning and implementation. Natural succession of habitats would be the selected strategy across the refuge. The refuge would be opened to public use only after all safety-related concerns were corrected. Additional opportunities for wildlife-dependent recreational activities would be reduced or eliminated within portions of the refuge. Fewer public-use trails would be developed.

Alternative B: Proposed Action
Proposed Public Use, Habitat Management and Facilities
Assabet River National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

0 1000 2000 3000 4000 5000 Feet

0 250 500 750 1000 1250 1500 Meters

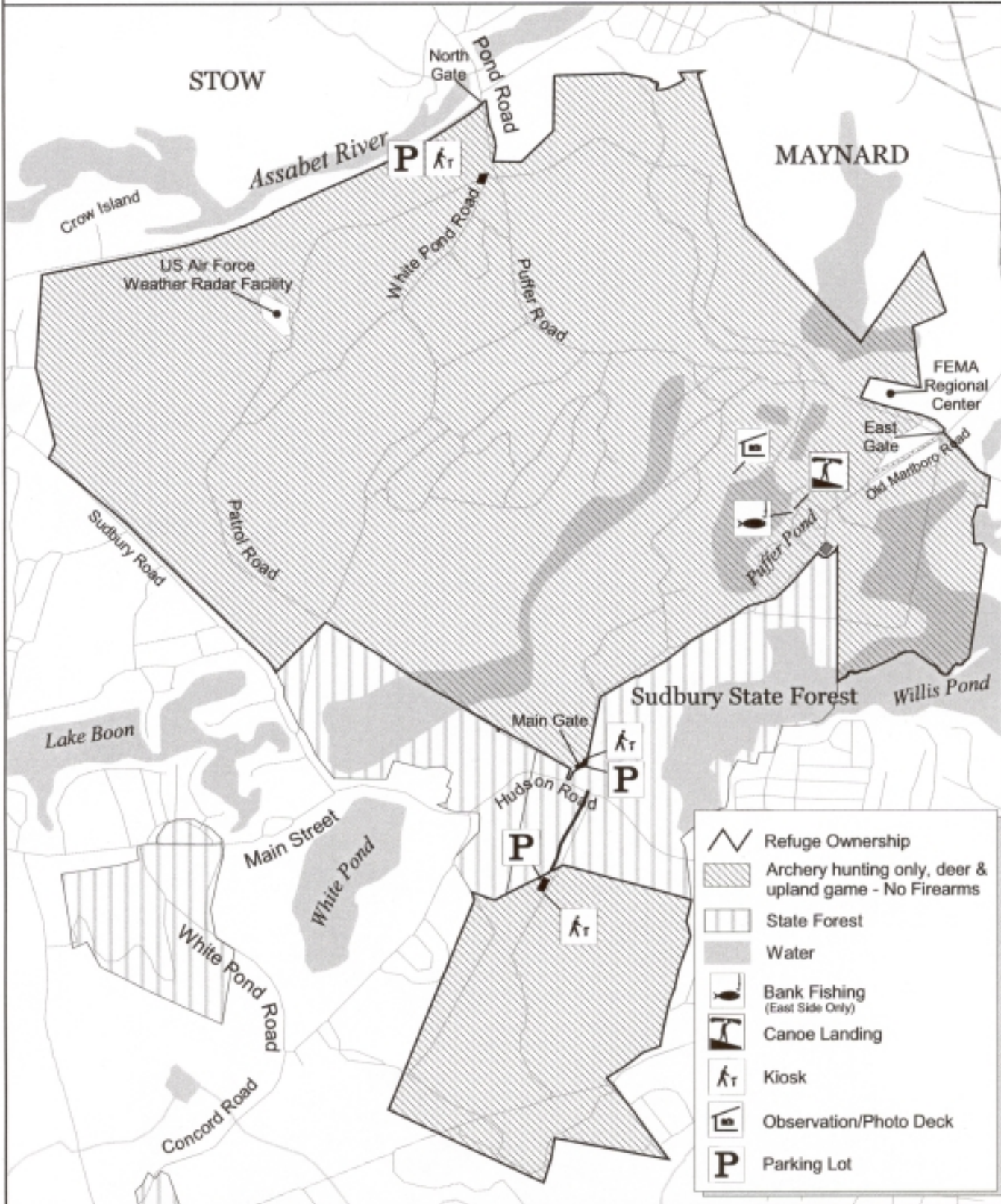


Alternative C

Public Use Habitat Management and Facilities

Assabet River National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

0 1000 2000 3000 4000 5000 Feet
0 250 500 750 1000 1250 1500 Meters



Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage habitats and wildlife populations?</i>	<p>Conduct annual surveys for woodcock, marsh birds, breeding birds, whip-poor-wills, migrating hawks and anurans.</p> <p>Obtain supplemental wildlife and habitat information from partners.</p> <p>Participate in partner-based monitoring contaminants program.</p> <p>Maintain existing old field habitat (approximately 60-70 acres) by mechanical means or fire management techniques.</p> <p>Maintain approximately 500 acres of existing wetland habitat.</p> <p>Restore approximately 40-50 acres of currently degraded wetlands.</p> <p>Allow existing mix of hardwood and pine forest to mature under natural succession processes.</p> <p>Selectively remove existing roads and trails not required for refuge maintenance, visitor use, or fire control purposes.</p> <p>Evaluate and re-uses ammunition bunkers which provide suitable for bat habitat.</p> <p>Selectively remove portions of the exterior fence which will allow for wildlife movement.</p> <p>Identify research needs.</p>	<p>In addition to Alternative A:</p> <p>Develop inventory list of migratory bird and federally listed threatened and endangered species.</p> <p>Inventory and evaluate population statuses of key, resident vertebrate and invertebrate species, including State listed threatened/ endangered species, deer, small mammals, frogs, and others on the refuge.</p> <p>Inventory refuge habitats surface hydrology, soils and topography</p> <p>Develop and update cover type map</p> <p>Identify focus species</p> <p>Develop species management objectives</p> <p>Develop & implement a Habitat Management Plan and a Habitat and Wildlife Inventory and Monitoring Plan which may utilize mechanical, chemical and fire management techniques to accomplish potential habitat plan recommendations</p> <p>Seek opportunities to develop cooperative management agreements with neighboring conservation agencies, organizations and individuals</p> <p>Restore those habitats which were severely impacted or destroyed as a result of military activities, including building and road removal where appropriate</p>	<p>Active management practices would be severely curtailed or eliminated.</p> <p>Planning and monitoring would be limited.</p> <p>Inventory migratory bird and Federal listed threatened and endangered species, resident vertebrate (e.g. deer, small mammals, anuran, etc.) and invertebrate species, including State listed threatened/ endangered species, on the refuge.</p> <p>Develop an updated cover type map</p> <p>Repeat inventory surveys at five year intervals to evaluate successional changes.</p>

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage invasive and overabundant species?</i>	Monitor known stands of invasive species, and implement control if project- specific funding becomes available.	Inventory and document all invasive, pest or overabundant species locations and extent.	Active management practices would be severely curtailed or eliminated.
	Continue to rely on partners to identify invasive species problems.	Monitor and evaluate rate of spread of invasive, pest or overabundant species.	Planning and monitoring would be limited.
	Continue beaver management program which currently relies primarily on non-lethal methods of control.	Develop and implement an Integrated Pest Management Plan (IPM) for invasive plant, pest or overabundant species which utilizes biological, mechanical, chemical and fire management or other control techniques.	Inventory and document all invasive species locations and pest or overabundant animal species.
		Manage overabundant/invasive animal populations identified in surveys using hunting, trapping and relocation, and lethal controls as may be necessary. Specifically, remove nuisance beaver where other control methods fail and remove territorial exotic mute swans from the refuge.	Monitor and evaluate rate of spread of invasive pest or overabundant species at five-year intervals.
		Conduct/participate in experimental control technique research.	

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How will the Refuge be opened to wildlife-dependent public uses?</i>	<p>Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.</p> <p>Special guided tours/events are organized to allow limited access to the refuge.</p>	<p>A Visitor Services Plan for the refuge will be prepared.</p> <p>The refuge will be opened in sections, along specific designated trails, as current safety problems are resolved within those sections.</p> <p>Potential strategies for a sequenced opening of the refuge include:</p> <ol style="list-style-type: none"> 1. Section from Hudson Road Gate along Patrol Rd. to North Gate. 2. Section from North Gate along Patrol and Old Marlboro Roads back to Hudson Road Gate. 3. Portion South of the Hudson Road. 4&5 Designated trails to be established in and through the ""bunkers"". 6. Section from North gate along White Pond Road back to Patrol Road. <p>When safety-related concerns have been eliminated, the two gates on either side of Hudson (State) Road (The old ""Main"" opened for public access to the Refuge. The former ""North Gate"" on White Pond Road will also be made available for public access.</p> <p>Minimally intrusive parking areas will be provided as funding and staff allow.</p> <p>An entrance fee will be collected.</p> <p>.</p>	<p>The refuge will be opened only after all safety issues are corrected on a site-wide basis, and along a limited subset of designated trails.</p>

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What upland and big game hunting opportunities would we provide?</i>	Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.	<p>A Refuge Hunting Plan will be prepared using the analysis from Alternative B and, if needed, refuge-specific regulations will be prepared.</p> <p>The refuge will be open to archery, shotgun and black powder deer hunting, if State mandated safety distances can be maintained</p> <p>Handicapped accessible hunting opportunities will be provided refuge-specific regulations will be prepared.</p> <p>Shotgun hunting of upland game birds, turkey and small game mammals will be permitted. Use of non-toxic shot would be required.</p> <p>Annual fee permits will be required for hunting on the refuge.</p>	<p>Same as Alternative B, except:</p> <p>The refuge will be open to archery and black powder deer hunting only.</p>
<i>What migratory game bird hunting opportunities would we provide?</i>	Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.	<p>Woodcock hunting on the refuge would be open.</p> <p>If supported by refuge specific wildlife and habitat inventories, portions of the refuge will be open to waterfowl. A Refuge Hunting Plan will be prepared using the analysis from Alternative B and, if needed, refuge-specific regulations will be prepared.</p> <p>Annual fee permits will be required for hunting on the refuge.</p>	Same as Alternative B.

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What fishing opportunities would we provide?</i>	Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.	<p>Catch and release fishing will be provided on Puffer Pond.</p> <p>Use of live bait and motorized water craft will not be permitted. Canoes are allowed. Ice fishing will not be permitted.</p> <p>Portions of the Pond perimeter may be closed from time to time to minimize bank vegetation damage.</p> <p>Handicapped accessible fishing opportunities will be provided.</p>	Same as Alternative B, except the westerly shoreline of the pond would not be opened for fishing.
<i>What wildlife observation and photography opportunities would be provided?</i>	Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.	<p>Approximatley 5-6 miles of designated trails/roads will be opened for wildlife-dependent uses such as wildlife observation and photography.</p> <p>One wildlife viewing platform and photography deck will be constructed.</p> <p>Monitor programs for impacts to wildlife, modify as needed.</p>	Alternative B would be modified to limit foot trails to only Patrol and Old Marlboro Road routes.
<i>What environmental education and interpretation opportunities would we provide?</i>	<p>Currently the refuge is closed to general public access and use due to a number of unmitigated safety hazards that exist on the property.</p> <p>Very limited interpretive programs occur, primarily organized and lead by partners, volunteers and the Refuge Friends group.</p>	<p>Provide on and off site environmental education programs.</p> <p>Coordinate with area environmental educators to integrate refuge programs with local environmental education programs.</p> <p>Provide assistance with teacher workshops, as requested.</p> <p>Construct three on-site informational kiosks in the vicinity of the Main, South and North gate entrances.</p> <p>Develop, construct and implement a self-guided interpretive trail or trails.</p> <p>Develop volunteer-led interpretive and education programs.</p> <p>Provide Service-led interpretive and education programs on the refuge.</p> <p>Review non-Service sponsored uses of the refuge for compatibility. Regulate these uses through Special Use Permits, Memoranda or Understanding or Agreement, or Concessions, as appropriate.</p>	Same as Alternative B

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How will the refuge provide outreach to increase the public's awareness of the refuge?</i>	<p>A very active Refuge Friends group is engaged in outreach programs.</p> <p>A electronic newsletter is distributed.</p> <p>A refuge Web-site and monthly news releases are used to provide information on refuge management activities and upcoming events.</p>	<p>Same as Alternative A plus:</p> <p>With partners, provide refuge related presentations to schools, clubs, and civic organizations when requested.</p> <p>One or more annual events (such as National Fishing Day, Refuge Week, etc.), which promote wildlife dependent uses and natural resource education will be held on the refuge.</p> <p>An Assabet River Refuge Brochure would be developed.</p> <p>Work with partners towards funding construction of a visitor contact station on the refuge.</p> <p>Work with partners to place information kiosks with refuge oriented materials at 3 off-refuge locations in the local communities.</p> <p>Develop programs to education local communities and landowners about existing opportunities and strategies for resource protection and restoration.</p> <p>Utilize on-going refuge management areas to illustrate beneficial wildlife and habitat practices.</p>	<p>Same as Alternative B, except on-refuge wildlife and habitat management demonstration areas would not be available.</p>
<i>How would we ensure resource protection and visitor safety?</i>	<p>Law enforcement would be provided by one full-time and one collateral-duty staff shared with other Complex refuges.</p> <p>Federal cultural resource protection laws and regulations are enforced.</p> <p>Soil disturbance requires cultural resource evaluations and clearance.</p>	<p>In addition to Alternative A:</p> <p>Survey sites proposed for construction of all facilities, roads, trails, buildings, etc. Modify construction as necessary to minimize impacts to cultural resources.</p>	<p>Same as Alternative B, except the refuge-wide archeological survey would be reduced in scope, eliminating studies needed to develop predictive models. Complete an overview survey of cultural resources of the refuge.</p> <p>Develop predictive model for probable archeological and historic sites.</p>

Table 2-4. Actions and Strategies Matrix, Assabet River National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What buildings and facilities would be used or constructed for refuge operations?</i>	No buildings are in use.	Using information provided in assessment of the condition and historical significance of buildings existing structures will be demolished. Work with partners towards funding construction of a visitor contact station on the refuge.	Same as Alternative B.
<i>What would be the future staffing needs at Assabet River Refuge?</i>	Current Minimum Staffing: 1 Refuge Operation Specialist (vacant) 1 Biologist (vacant) 1 Park Ranger (LE) (vacant) 1 Outdoor Recreation Planner (vacant) 1 Biologist (vacant) 2 Maintenance Workers (vacant) Total FTEs 7	In addition to Alternative A: 1 Administrative Technician 1 Forester (shared with other Complex Refuges) Total FTEs (A+B) 9	Same as Alternative A (except the biologist), plus : 1 Administrative Technician Total FTEs 7

Part 2: Great Meadows National Wildlife Refuge

Actions Common to All Alternatives for Great Meadows Refuge

Wild and Scenic River Designation

Great Meadows National Wildlife Refuge protects 12 miles of the Concord and Sudbury Rivers, which are designated under the Wild and Scenic Rivers Act. For a complete description of the designation see Chapter 3: Part 2 Great Meadows National Wildlife Refuge.

Under all alternatives, we would continue to work with our partners to develop a Wild and Scenic River Plan, as required by the establishing act. We have also identified funding needs in our Refuge Operations Needs System (RONS), Appendix E, for both biological and interpretive programs to enhance our management and conservation of these two rivers where they flow thru/by the refuge. None of the actions proposed in any of the alternatives violate the guidelines for Wild and Scenic river designations. For additional information on this designation, see Chapter 3: Part 2 or log onto <http://www.nps.gov/rivers/wsr-suasco.html>.

Alternative A: Current Management

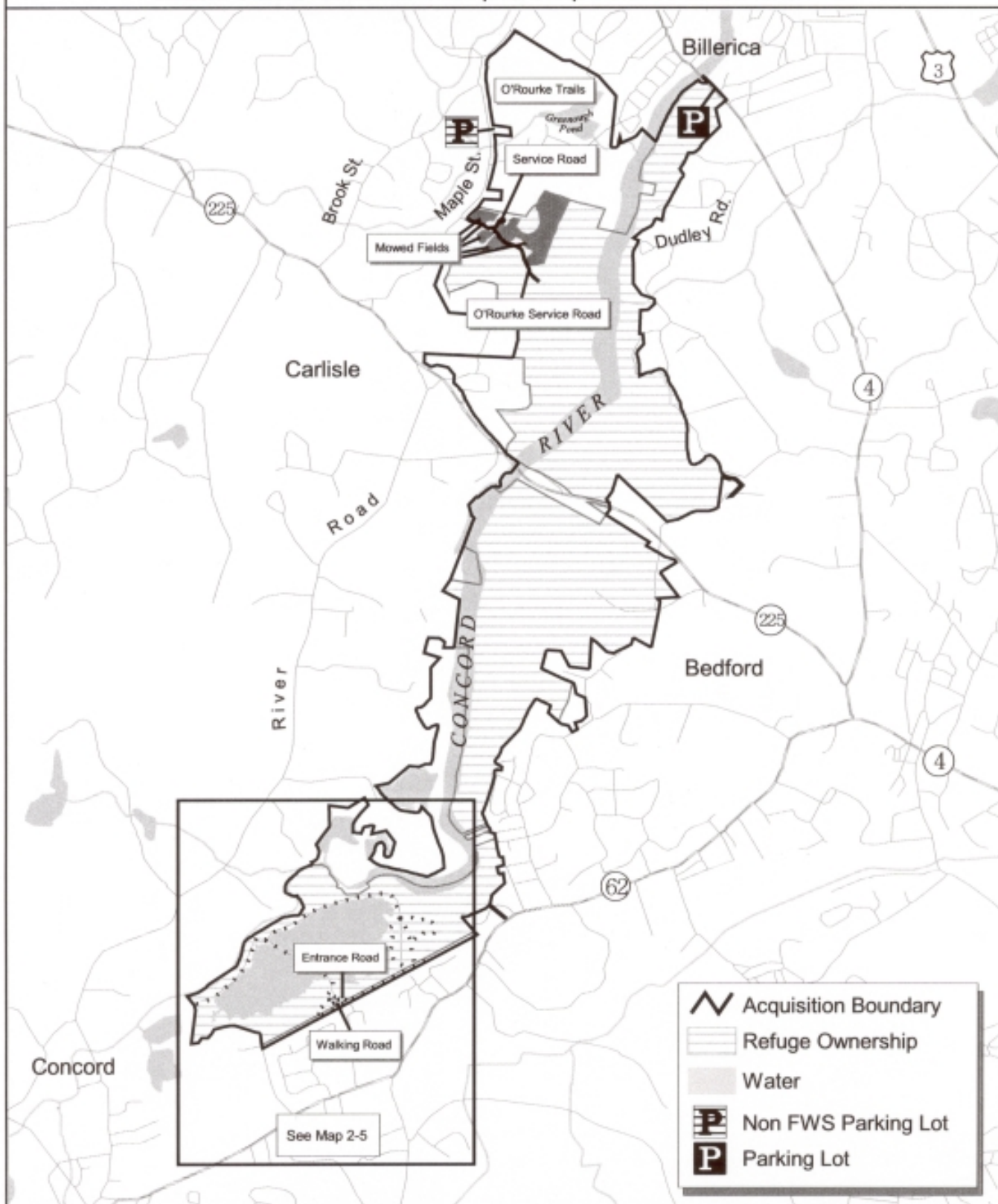


Great blue heron with fish. *Many different marsh birds find food at the Concord Impoundments. Photo by Bruce Flaig*

The Current Management Alternative represents the anticipated condition of the refuge (and associated resources) if current policies, programs and activities continue in a manner consistent with recent or foreseeable trends. While this alternative does not represent a true “status quo” condition, neither does it propose major changes in public use/wildlife management programs or facilities.

Maintaining the level of wildlife and habitat inventories that began in 2000 would, for the first time since refuge establishment, build a foundation of natural resource information upon which to base long range management plans. Ongoing maintenance of grassland/shrub and wetland impoundment habitats combined with implementation of plans emerging from the evolving information base would ensure that wildlife and habitat diversity is maintained at Great Meadows Refuge. Existing wildlife observation facilities and education programs would accommodate visitor uses at current levels that provide social and economic benefits to area communities.

Alternative A: Current Management
Existing Public Use and Habitat Improvements at Concord Unit
Great Meadows National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

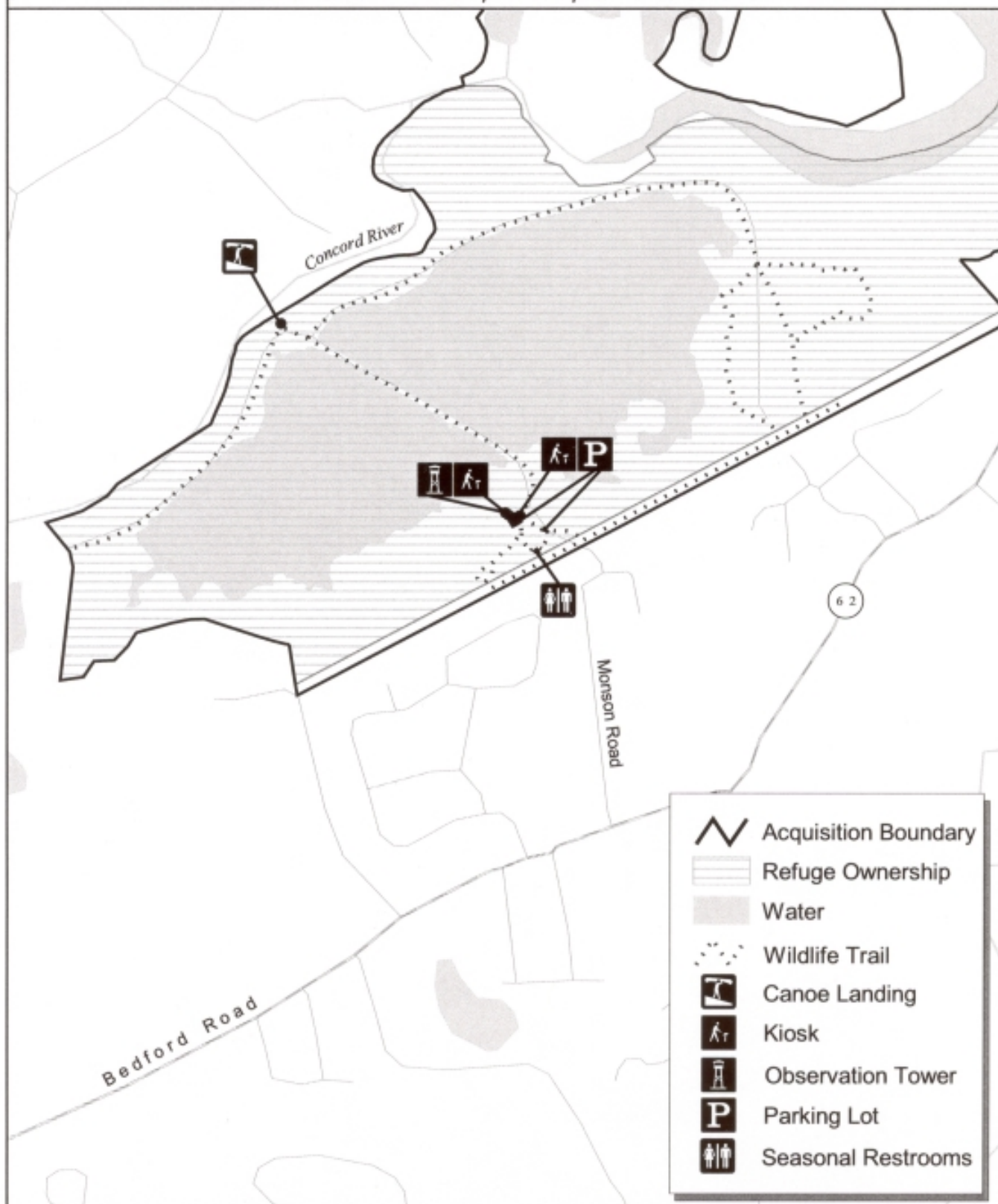
Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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Alternative A: Current Management
Existing Public Use at Concord Impoundments
 Great Meadows National Wildlife Refuge
 Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.
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Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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Alternative A: Current Management

Existing Public Use at Sudbury Unit

Great Meadows National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

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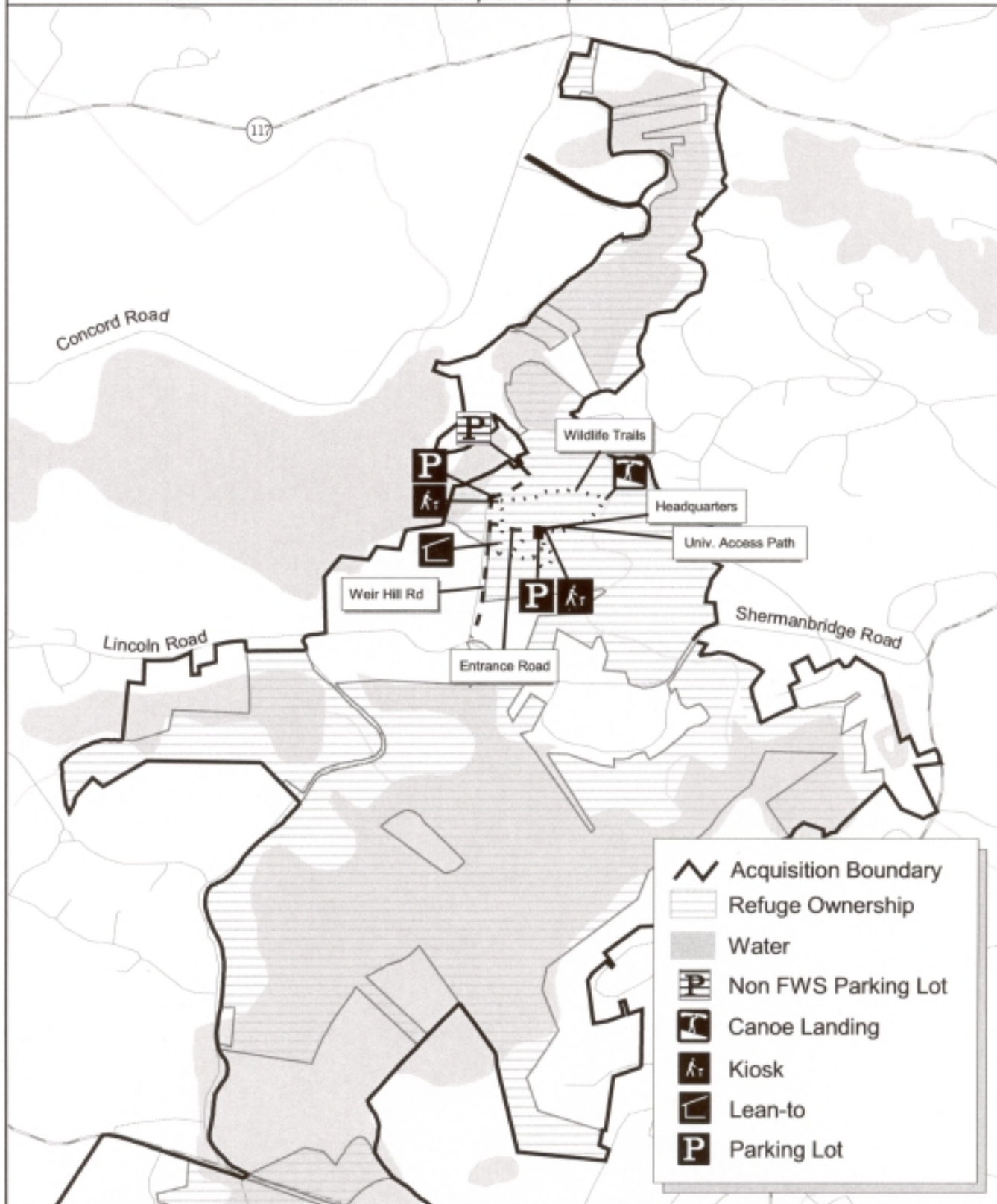


Alternative A: Current Management

Existing Public Use at Sudbury Unit

Great Meadows National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

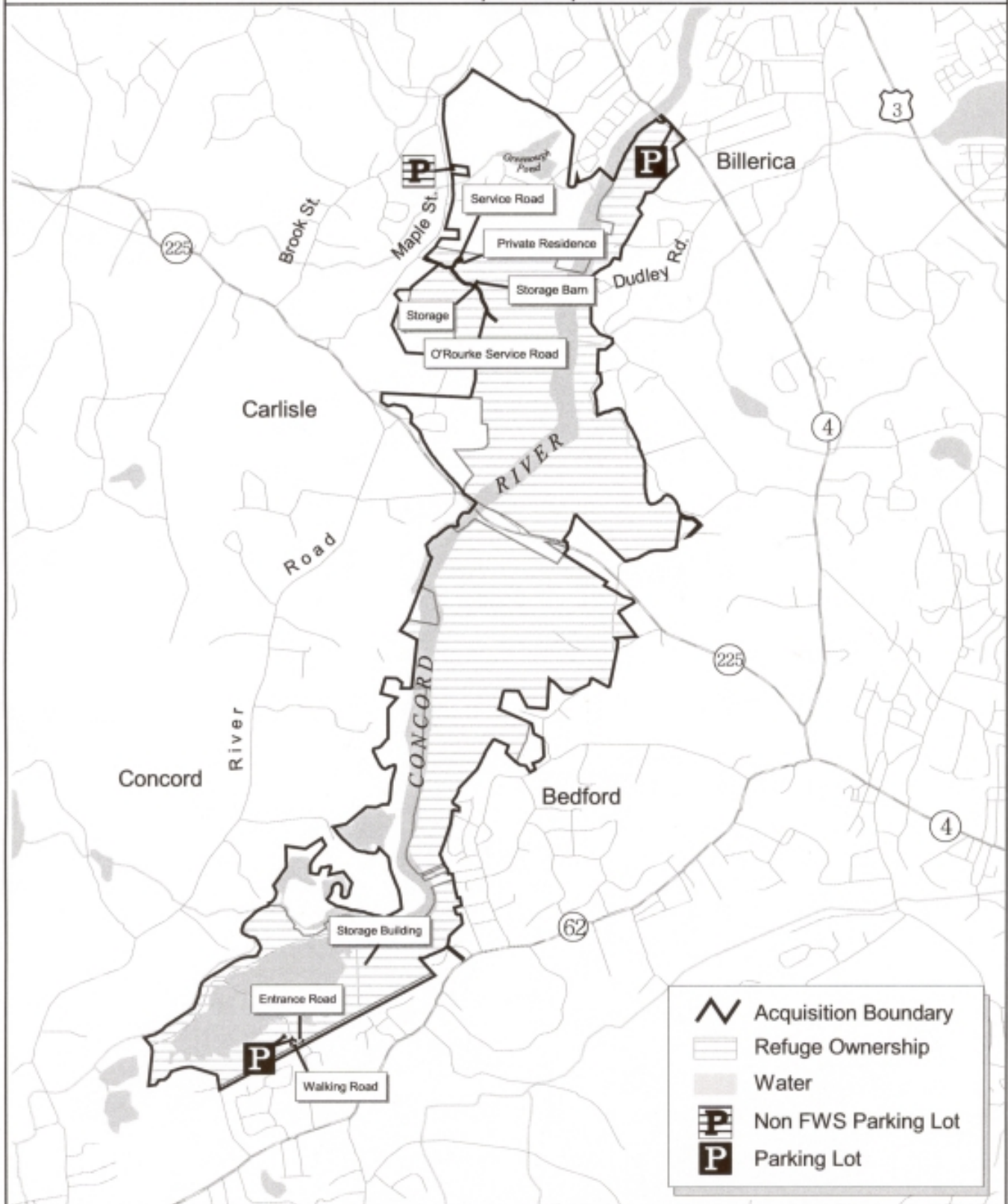
Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

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Alternative A: Current Management
Existing Facilities at Concord Unit
Great Meadows National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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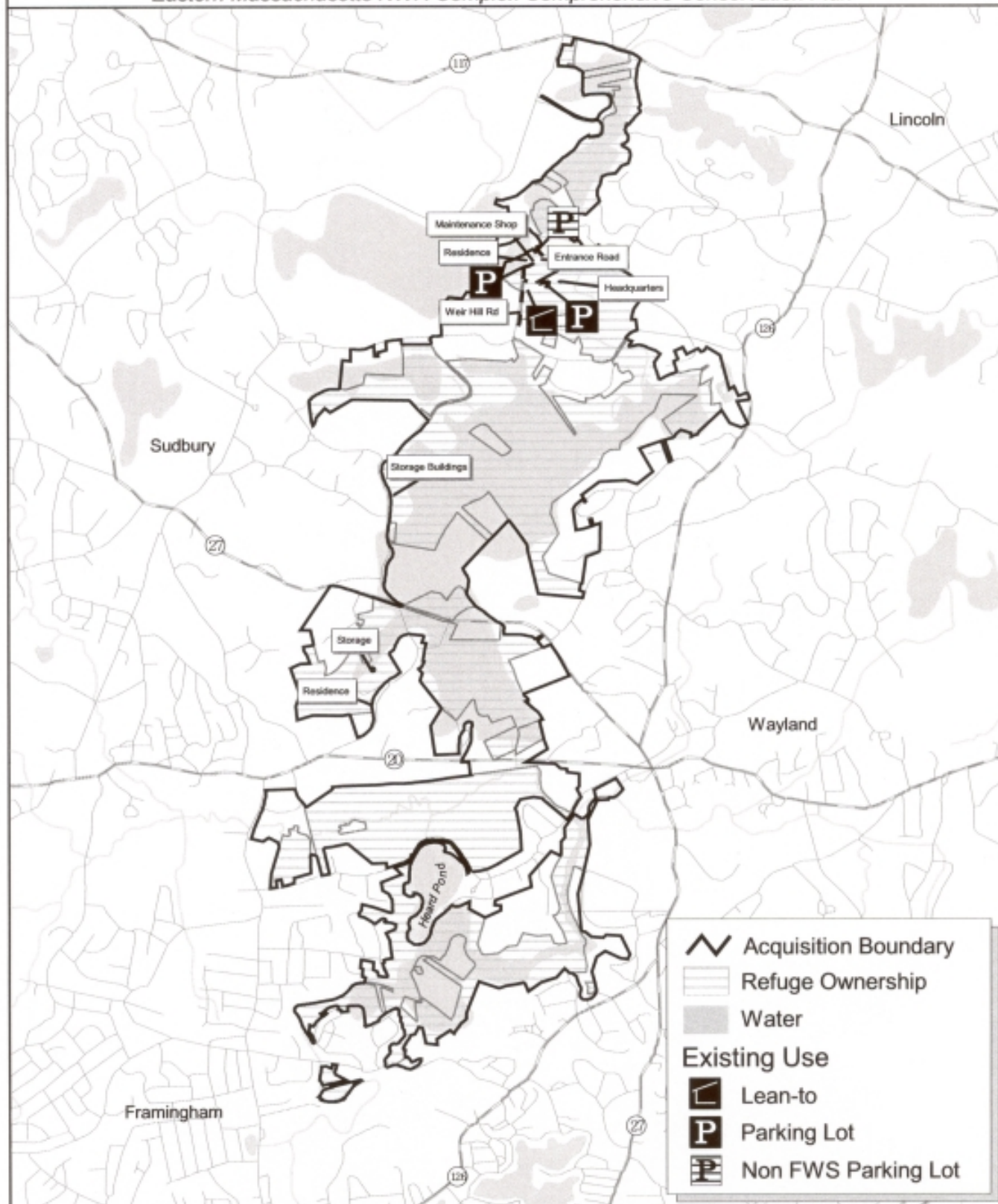


Alternative A: Current Management

Existing Facilities at Sudbury Unit

Great Meadows National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.





Common reed. *USFWS Photo*

Our Proposed Action for habitat and wildlife management includes four parts:

1. Collect information for all species on the refuge,
2. Determine resources of concern based on national and regional Service plans,
3. Using information gathered in Steps 1 and 2, develop a Habitat Management Plan,
4. Develop a Habitat and Wildlife Inventory and Monitoring Plan to insure objectives in the Habitat Management Plan are reached.



Trail at Great Meadows Refuge.

Proposed trails and observation platforms offer visitors additional opportunities for wildlife observation and photography. USFWS Photo

Alternative B- The Service's Proposed Action

Under Alternative B, refuge staffing and funding levels would be increased, and we would initiate new wildlife population, habitat, and invasive/overabundant pest species management activities and provide new compatible wildlife-dependent recreational opportunities. The refuge would also work with State, Federal, and non-governmental partners to secure funding for the construction of new visitor facilities including a Concord visitor contact station and a new visitor center to support the goals and objectives of the Refuge System at Great Meadows Refuge.

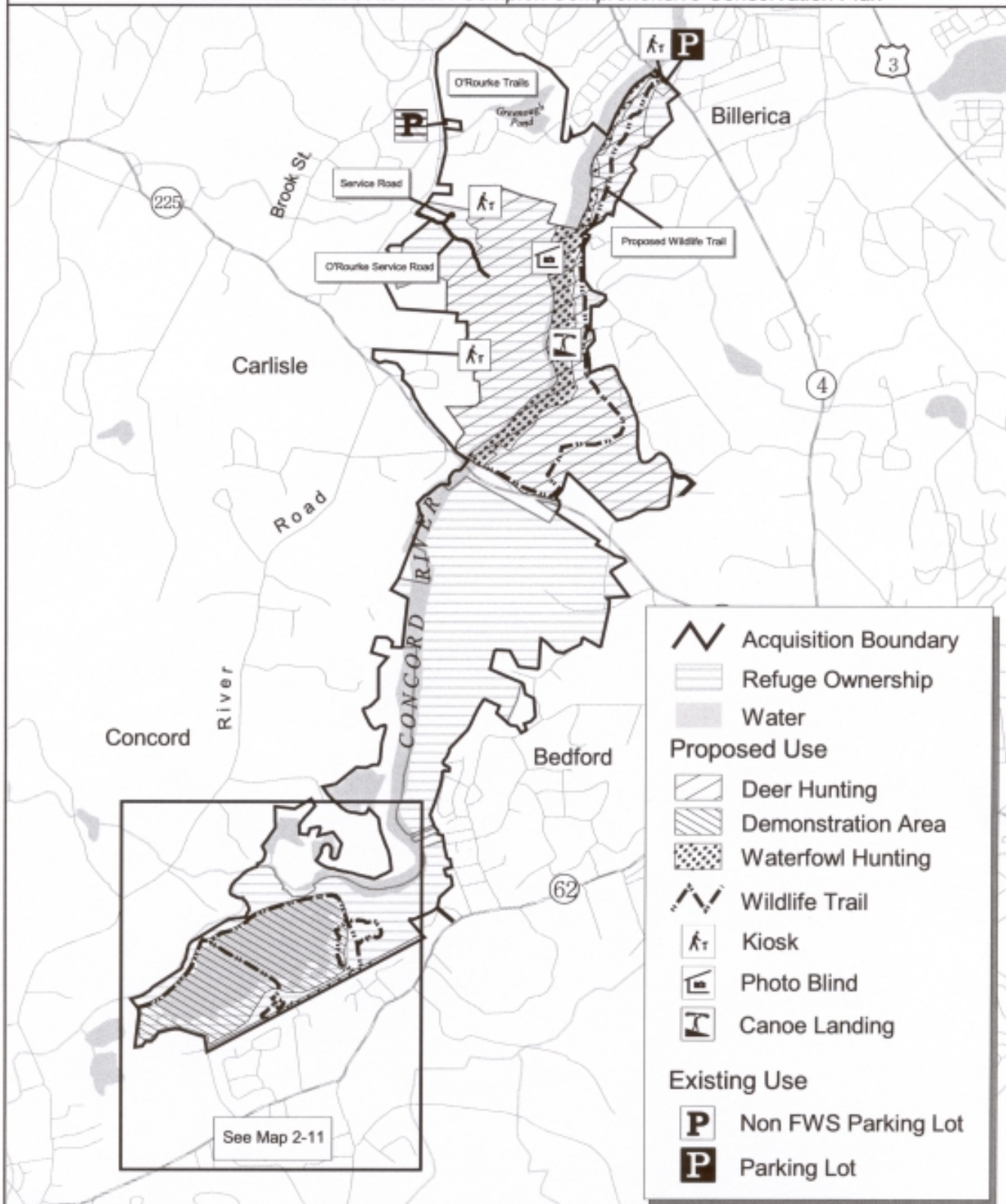
Special emphasis would be placed on obtaining baseline data of wildlife populations and habitat conditions required to develop detailed step-down plans. This data would be needed to provide a professional and scientifically adequate resource for future management planning. Wildlife population and habitat monitoring surveys and inventories would be continued to provide the data needed to assess the effectiveness of management programs and practices, and to make mid-course adaptations to these practices to ensure they meet long-range refuge goals and objectives.

Special emphasis would also be placed on providing enhanced, and sustainable, opportunities for the six priority, wildlife-dependent public uses defined in the Refuge Improvement Act of 1997 (environmental education, fishing, hunting, interpretation, photography and wildlife observation). The Visitor Services Plan, which is part of the Proposed Action, would include a monitoring program to evaluate intensity and potential impact of all the wildlife-dependent public uses on the refuge. Public use activities in general may be modified in the future if adverse impacts on wildlife or habitat are identified. Public use evaluations, along with wildlife and habitat monitoring programs, would assist the refuge in both assessing the intensity of public use and adapting our management strategies and practices for those uses. The Proposed Action is also summarized under Alternative B in **Table GRM 2-6**.

Alternative C

Under this alternative little wildlife or habitat management would occur. Great Meadows Refuge lands would succeed to climax stages or be dominated by invasive species. This would lower habitat and species diversity causing the refuge to become a less interesting place for wildlife enthusiast to visit. The focus of this alternative for this refuge is public use. Under this alternative, public use would be expanded even beyond Alternative B.

Alternative B: Proposed Action
Proposed Public Use at Concord Unit
 Great Meadows National Wildlife Refuge
 Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

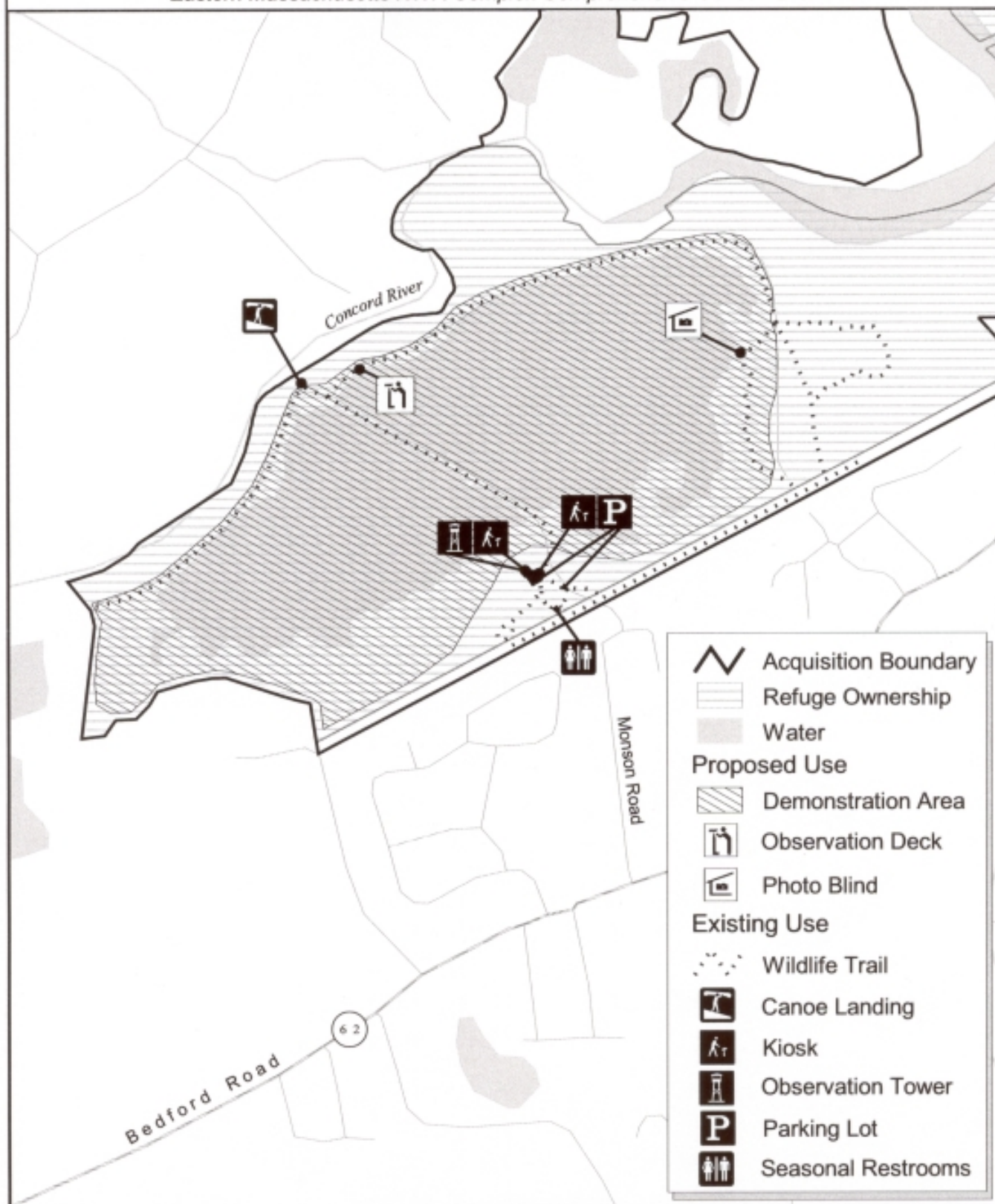
Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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Alternative B: Proposed Action
Proposed Public Use at Concord Impoundments
Great Meadows National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

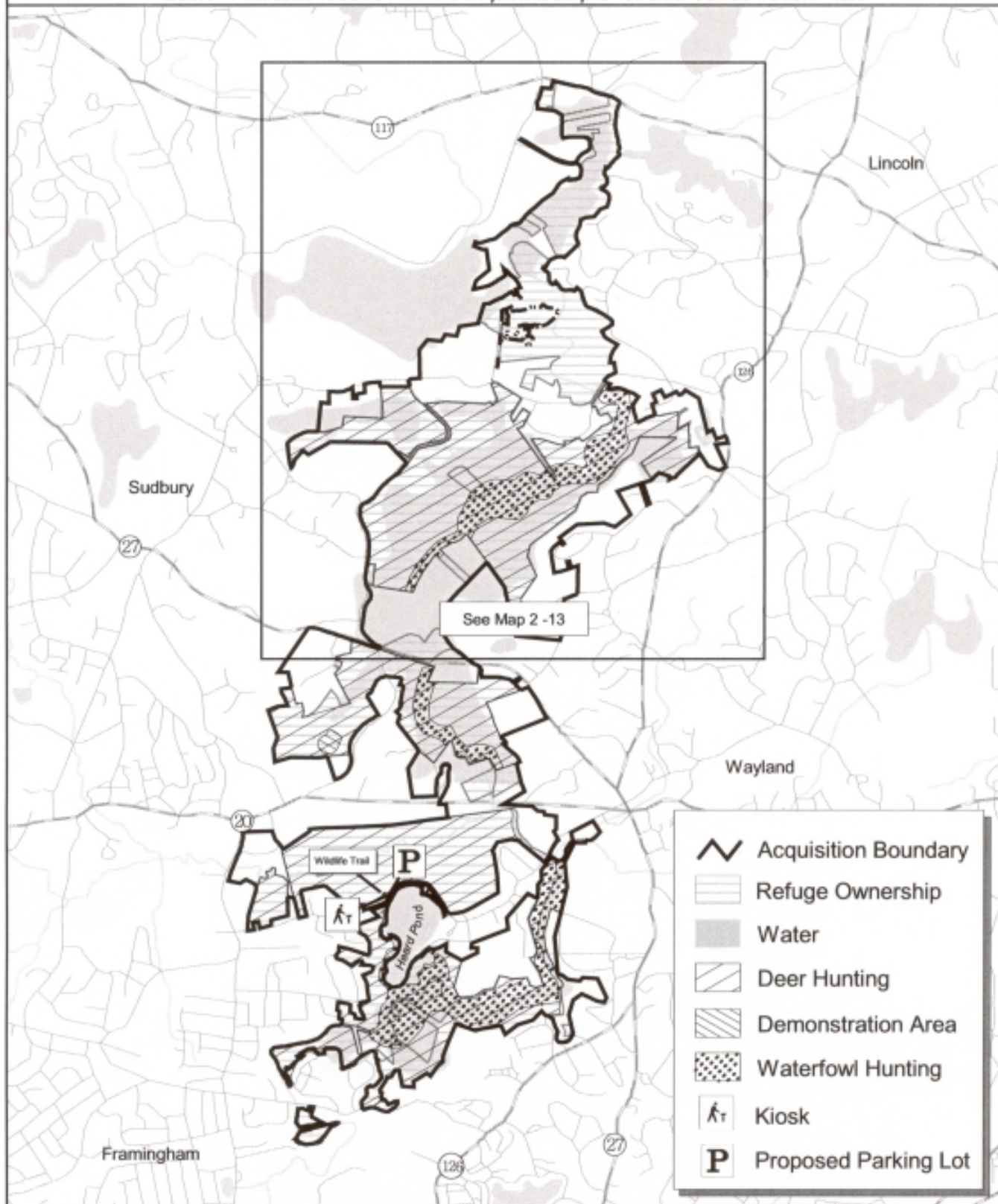
Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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Alternative B: Proposed Action
Proposed Public Use at Sudbury Unit
Great Meadows National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

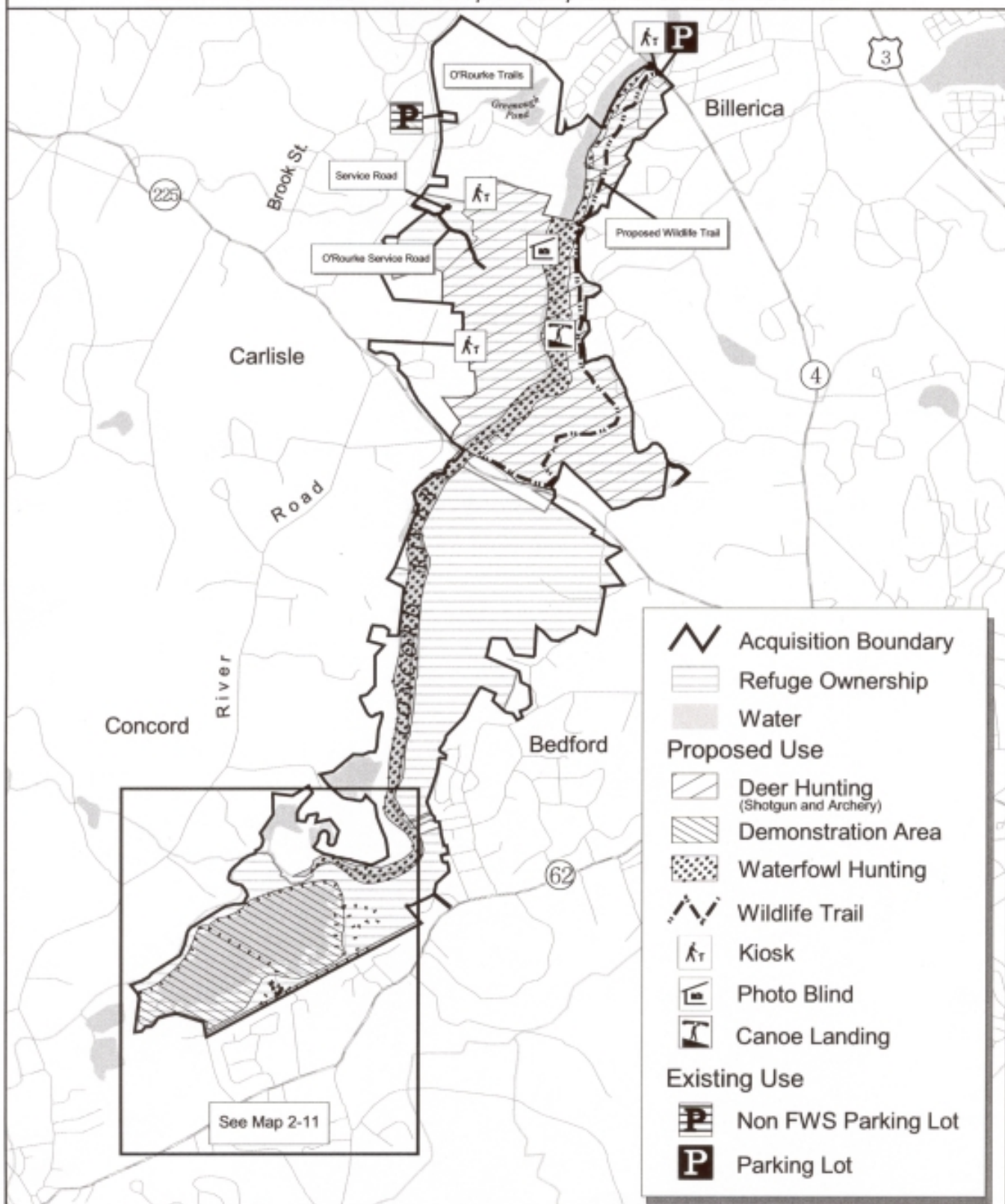
Map prepared for Eastern Massachusetts National Wildlife
 Refuge Complex Comprehensive Conservation Plan,
 August 2001. This map is for planning purposes only.

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Alternative C
Public Use at Concord Unit
Great Meadows National Wildlife Refuge
Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
 USGS 1:100,000 roads & hydrology.
 USFWS refuge boundaries & other
 refuge information.

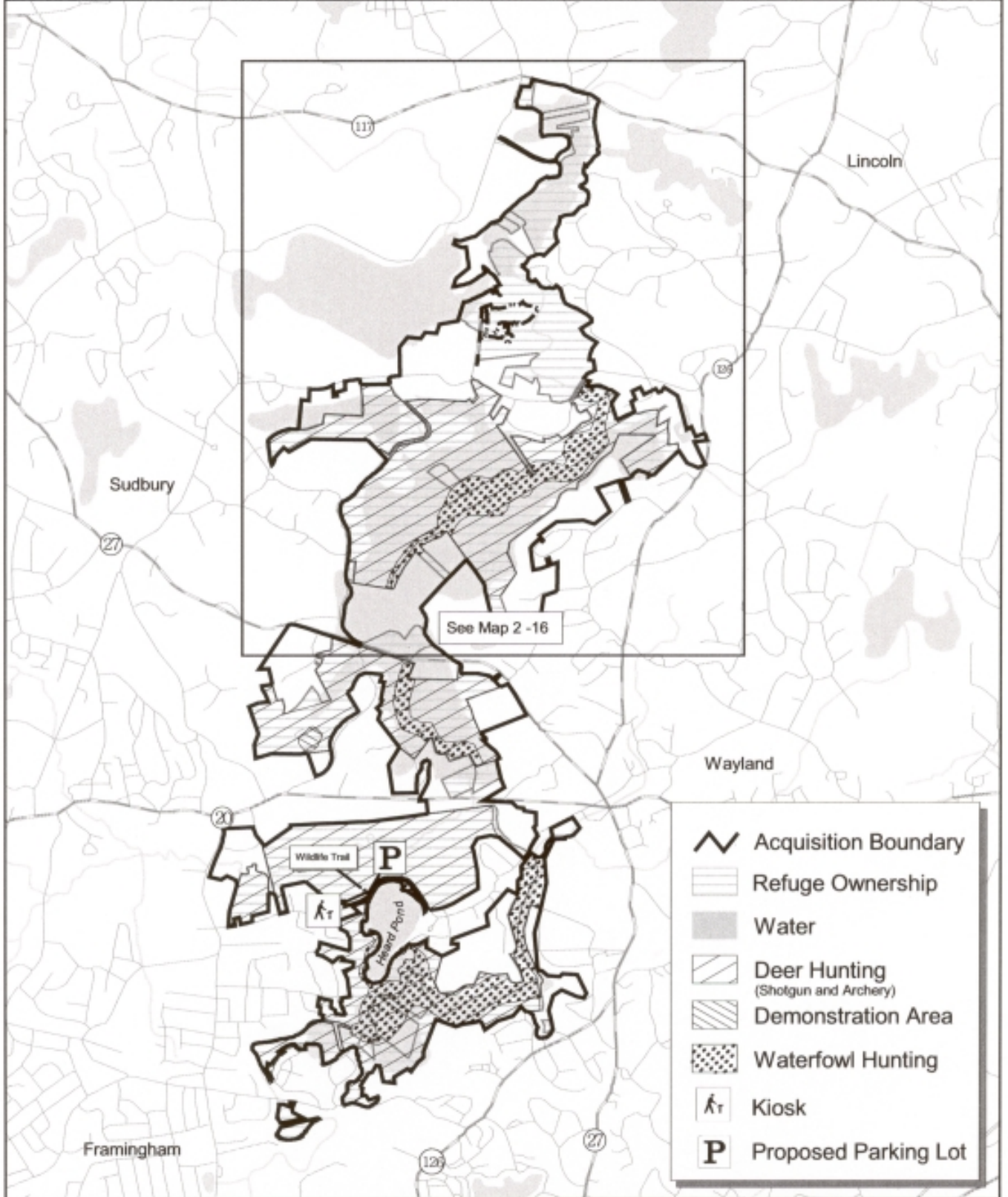
Map prepared for Great Meadows National Wildlife
 Refuge Comprehensive Conservation Plan, August 2000.
 This map is for planning purposes only.

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Alternative C Public Use at Sudbury Unit Great Meadows National Wildlife Refuge Eastern Massachusetts NWR Complex Comprehensive Conservation Plan

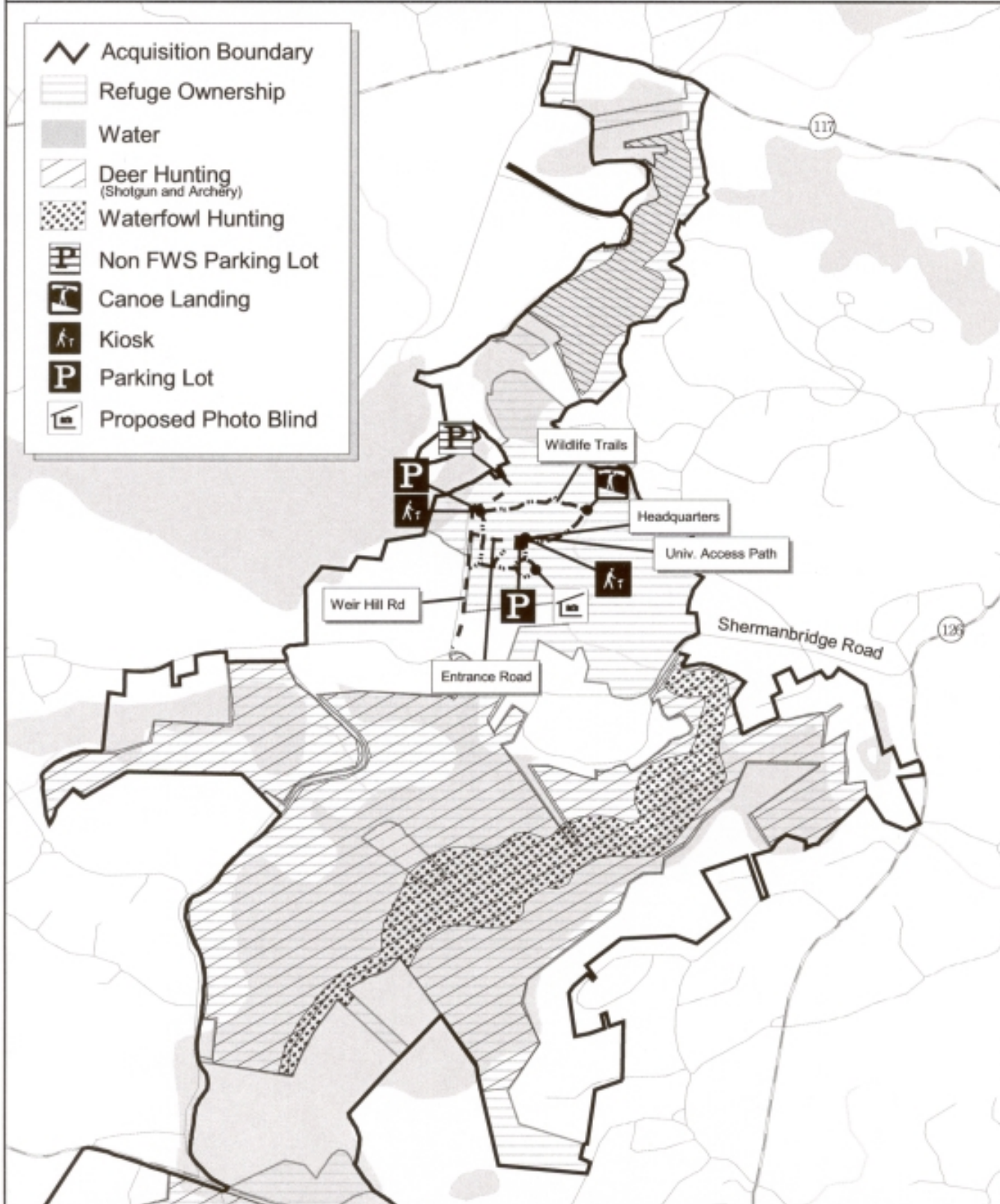


Alternative C

Public Use at Sudbury Unit

Great Meadows National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

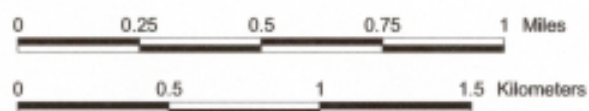


Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage habitats and wildlife populations?</i>	Inventory breeding birds, marsh birds, woodcock, anurans, waterfowl, shorebirds annually	Same as Alternative A plus: Conduct baseline surveys on plants, invertebrates, mammals, amphibians, reptiles and fish, and birds to determine species presence; repeat baseline surveys every 10 years.	Conduct baseline surveys on plants, invertebrates, fish, small mammals, amphibians and reptiles to determine species presence
	Manage Concord impoundments for waterfowl and shorebirds annually. Maintain current water control structures		Develop a Wildlife Inventory Plan
	Band waterfowl annually through partners	Inventory refuge habitats and produce a cover type map every ten years which includes broad habitats (wetland, grassland, shrub) as well as specific endangered/threatened plants	Inventory refuge habitats and produce a cover type map every ten years which includes broad habitats (wetland, grassland, shrub) as well as specific endangered/ threatened plants
	Conduct bald eagle survey annually		
	Monitor wood duck box production annually through partners	Using survey results, develop a list of focus species and habitats using regional standards which includes Federally-listed species	
	Monitor and maintain bluebird nesting boxes annually		
	Assist USFWS Fisheries Assistance Office, as needed, with reintroduction and survey efforts of spawning habitat for interjurisdictional fish including shad, alewife, herring and Concord and Sudbury Rivers	Develop & implement a Habitat Management Plan and a Habitat and Wildlife Inventory and Monitoring Plan which may utilize mechanical, chemical and fire management techniques to accomplish potential habitat plan recommendations	
	Collect information on plant species and water quality through collection of partners/volunteers data	Eliminate cooperative farming program within 2 years. Plant appropriate native vegetation.	
	Maintain existing open fields (approximately 100 acres) through mowing every 3-5 years	Initiate research on the impact of public use on wildlife and the impact of water quality and quantity on wetland resources	
	Allow partner to cooperatively farm 6 acres parcel in Concord	Seek opportunities to develop cooperative management agreements with neighboring conservation agencies, organizations and individuals	

Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage invasive and overabundant species?</i>	<p>Beetles and weevil are released in Concord, Sudbury, Wayland and Carlisle to control purple loosestrife annually</p> <p>Large monotypic stands of cattail at Concord unit are managed through water level manipulation, herbicide and mowing</p> <p>Concord impoundments are alternately flooded and drained for a growing season at least every third year to control water chestnut.</p> <p>Aquatic weed harvester used by refuge staff and partners to remove water chestnut in Sudbury and Concord Rivers and surrounding ponds</p> <p>Beaver deceivers are used as a nonlethal control methods for nuisance beaver to allow refuge to manage water levels on refuge</p>	<p>Same as Alternative A plus:</p> <p>Survey invasive and exotic species and extent of distribution</p> <p>Develop refuge-wide map of invasive species.</p> <p>Purple loosestrife beetle program expanded. Refuge raising and releases beetles annually throughout refuge</p> <p>Remove established common reed</p> <p>Develop and implement Integrated Pest Management program for controlling invasive species found on the refuge including biological, chemical, mechanical and fire management techniques</p> <p>Evaluate and modify control techniques for species found, each year using: plot sampling, estimates of cover, and response of wildlife and other plants</p> <p>Manage overabundant/invasive animal populations identified in surveys using hunting, trapping and relocation, and lethal controls as may be necessary. Specifically, remove nuisance beaver where other control methods fail and remove territorial exotic mute swans from the refuge.</p> <p>Participate in appropriate experimental invasive species control programs</p>	<p>Survey invasive and exotic species and extent of distribution</p> <p>Develop refuge-wide map of invasive species</p>
<i>What big and upland game hunting opportunities would we provide?</i>	No hunting opportunities exist	<p>Open archery deer hunting within State guidelines on portion of the Refuge South of Sherman's Bridge in towns of Sudbury, Lincoln, Wayland and Framingham</p> <p>Open archery deer hunting within State guidelines on portions of the Refuge north of 225 bridge in the towns of Bedford, Billerica and Carlisle</p> <p>Complete Hunt Plan Prior to opening Refuge to hunting. Refuge charge special permit fee for hunting on refuge</p> <p>No upland small game hunting allowed</p>	<p>In addition to Alternative B:</p> <p>Initiate shotgun deer hunting on same areas as archery deer hunting was opened.</p> <p>No upland small game hunting allowed.</p>

Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What migratory game bird hunting opportunities would we provide?</i>	No hunting opportunities exist .	<p>Open waterfowl hunting within State guidelines on the portions of the Sudbury River south of Sherman's Bridge and from Pantry Brook to Route 117 in Towns of Sudbury, Lincoln, Wayland and Framingham</p> <p>Open waterfowl hunting within State guidelines on portions of the refuge on the Concord River north of the Town of Concord in towns of Bedford, Billerica and Carlisle</p> <p>Open waterfowl hunting on the banks of Heard Pond, Wayland, from Refuge land</p> <p>Complete Hunt Plan Prior to opening Refuge to hunting.. Refuge charges special permit fee for hunting on Refuge</p>	<p>Open all refuge waters to waterfowl hunting (except Concord impoundments) according to state guidelines</p> <p>Complete Hunt Plan Prior to opening refuge to hunting. Refuge charges special permit fee for hunting on refuge</p>
<i>What fishing opportunities would we provide?</i>	<p>Continue to allow river fishing throughout the Refuge on Sudbury and Concord Rivers</p> <p>All refuge pools remain closed</p>	Same as Alternative A	Same as Alternative A
<i>What wildlife observation and photography opportunities would we provide?</i>	<p>Provide wildlife viewing opportunities at: Heard Pond- Wayland, Weir Hill trails- Sudbury, Dike trails, and observation tower- Concord, Two Brothers Rock- Bedford, O'Rourke Trails- Carlisle, Route 4 trail- Billerica/Bedford Trail</p> <p>Concord and Sudbury Rivers via canoe- open through all 8 towns. Maintain existing canoe landings</p> <p>Host Wildlife photography contest and display all entries in refuge Visitor Center</p>	<p>In addition to Alternative A:</p> <p>Develop Visitor Services Plan</p> <p>Re-establish parking area at Heard Pond- Wayland</p> <p>Create photo blinds at three sites within refuge</p> <p>Increase directional signage to all public use areas</p> <p>Create habitat demonstration areas to explain management and observe wildlife</p> <p>Conduct research project on impacts of public uses and carrying capacity of areas</p> <p>An entrance fee will be charged</p>	Same as Alternative B

Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What environmental education and interpretation opportunities would we provide?</i>	<p>Provide for over 100 on-site environmental education programs annually</p> <p>Offer teacher workshops on refuge Environmental Ed. programs at least twice a year</p> <p>Work with Boston and Worcester schools through the Urban Education Program</p> <p>Provide off-site education programs as requested at local schools and on-site interpretive programs</p> <p>Maintain 3 interpretive kiosks- Weir Hill, Heard Pond, Dike trails & provide brochures at existing refuge public use sites</p> <p>Maintain 2 self-guided interpretive trails: Concord Dike trails and Weir Hill trail</p> <p>Host 4 on-site special events/celebrations annually</p> <p>Allow partners (via required Special Use Permit) to conduct education programs on-refuge, no charge for permit</p> <p>Allow cooperating association, SuAsCo Great Meadows Education Fund to run a small book store at the refuge headquarters</p> <p>Quarterly news letter on the "web" and viewed by over 3000 people</p> <p>Refuge Web-site and monthly news releases used to explain refuge management and upcoming activities</p> <p>Refuge visitor center with exhibits and headquarters is open year round.</p> <p>Provide programs within the local community as requested.</p> <p>Active volunteer force helps staff provide on and off site programs</p>	<p>Same as Alternative A plus</p> <p>Develop Visitor Services Plan</p> <p>Develop refuge specific curriculum for grades k-12.</p> <p>Provide accredited teacher workshops</p> <p>Disseminate school groups more evenly between Dike trail and other outdoor classrooms</p> <p>Expand Urban Education Program to more inner city schools in Boston area</p> <p>Allow private groups to conduct programs on refuge via required Special Use Permit, Memorandum of Understanding, Memorandum of Agreement, or concession to conduct education programs on-refuge</p> <p>Install 4 kiosks at areas with wildlife observation opportunities</p> <p>Develop self-guided canoe trail with interpretive brochures on Concord and Sudbury Rivers</p> <p>Increase interpretive outreach to hunters and anglers through hunter education programs</p> <p>Develop environmental education partnerships, introductory refuge video for all age groups, and wildlife learning materials for children</p> <p>Conduct outreach related to environmental education opportunities at refuge</p> <p>Increase interface with education community, & help develop wildlife classroom projects</p> <p>Reach out to local community groups, especially those that are not the refuge's typical audience</p> <p>Develop interpretive materials for placement in the Boston metropolitan area to reach nontraditional audiences</p> <p>Active friends group supports refuge activities</p> <p>An entrance fee will be charged</p>	Same as Alternative B

Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What non-wildlife dependent public uses would be allowed on the refuge?</i>	Current nonwildlife-dependent uses occurring: picnicking jogging dog walking (on leash)	Eliminate non-wildlife dependent uses. Refuge is closed to picnicking and dog walking. Study impacts of jogging	Same as Alternative B
<i>How would we ensure resource protection and visitor safety?</i>	Wildlife and cultural resource law enforcement is provided by two full-time and one co-lateral duty staff shared with other Complex refuges. Federal cultural resource protection laws and regulations are enforced. Soil disturbance requires cultural resource evaluations and clearance	In addition to Alternative A: Hire additional full-time Park Rangers Complete an overview survey of cultural resources of the refuge. Develop predictive model for probable archeological and historic sites.	Same as Alternative B, except the refuge-wide archeological survey would be reduced in scope, eliminating studies needed to develop predictive models.
<i>What buildings and facilities would be used or constructed for Refuge operations?</i>	Continue to use existing refuge buildings including Refuge Visitor Center/ headquarters- Sudbury Comfort Station- Concord 4 storage barns/buildings (Sudbury- 3, Concord) 3 residences (Sudbury 2, Carlisle)	Same as Alternative A plus: Conduct a Site Requirement Analysis Construct new Visitor Center in the high traffic flow area Construct new Visitor Contact Station at Concord Unit	Same as Alternative B

Table 2-6. Actions and Strategies Matrix, Great Meadows National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What would be the future staffing needs at Great Meadows Refuge?</i>	1 Refuge Manager (Vacant) 3 Maintenance Workers 1 Office Assistant 1 Admin Support Ass. (Vacant) Total FTEs = 6	Alternative A plus: 1 Biologist 1 Biological Technician (Seasonal) 1 Education Specialist 3 Park Rangers 1 Outreach Specialist/ Volunteer Coordinator 1 Maintenance Worker Total FTEs = 14	Alternative A plus: 1 Education Specialist 3 Park Rangers 1 Outreach Specialist/ Volunteer Coordinator 1 Maintenance Workers Total FTEs(A+C)= 12
<i>Should the two Units within Great Meadows NWR be spilt into 2 separate NWRs?</i>	Great Meadows Refuge remains one refuge with 2 Units Concord Unit and the Sudbury Unit	The Concord Unit (From 117 Bridge in Lincoln/Concord to the Northern boundary) remains Great Meadows NWR and the Sudbury Unit (From 117 Bridge in Lincoln/Concord to the Southern boundary) becomes the Sudbury River Refuge	Same as Alternative B



Refuge staff and volunteers clear a trail. *USFWS Photo*

Part 3: Oxbow National Wildlife Refuge

Alternative A - The Current Management Alternative

The Current Management Alternative represents the anticipated condition of the refuge (and associated resources) if current policies, programs and activities continue in a manner consistent with recent or foreseeable trends. While this alternative does not represent a true “status quo” condition, neither does it propose major changes in public use/wildlife management programs or facilities.

Habitat management that sustains small blocks of grassland/shrub, wetland, and turtle nesting habitat would help maintain some habitat diversity at Oxbow Refuge. Periodic release of selective insects would help reduce the spread of the invasive plant purple loosestrife. An absence of well-planned wildlife and habitat inventories would fall short of adequately accounting for these resources.

Unmet demand for hunting, fishing, hiking and other recreation opportunities would continue, as no action would be taken to expand these activities at the refuge. The ability to attract more supportive constituents is not anticipated to improve because education and outreach concerning Oxbow Refuge would only occur as an adjunct to outreach programs for the much larger Eastern Massachusetts Refuge Complex. Oxbow Refuge would continue to have only minor social or economic connection to surrounding communities.

Alternative B - The Service's Proposed Action

Under the Service's Proposed Action, refuge staffing and funding levels would be increased, and we would initiate new wildlife population, habitat and invasive and overabundant species management activities; and provide new compatible wildlife-dependent recreational opportunities. We would also work with State, Federal and non-governmental partners to secure funding for the construction of new visitor facilities and a visitor contact station to support the goals and objectives of the National Wildlife Refuge System and the Oxbow Refuge.



American Woodcock. *USFWS Photo*

Special emphasis would be placed on obtaining baseline data of wildlife populations and habitat conditions required to develop the detailed step-down plans under this CCP. These plans are needed to provide professional and scientifically adequate resource management planning. Wildlife population and habitat monitoring surveys and inventories would be continued to provide the data needed to assess the effectiveness of management programs and practices, and to make mid-course adaptations to these practices to ensure they meet long-range refuge goals and objectives.



Students participating in the Urban Education Program at Oxbow Refuge.
Under the Proposed Action, the refuge would expand this program.
USFWS Photos

Our Proposed Action for habitat and wildlife management includes four parts:

1. Collect information for all species on the refuge,
2. Determine resources of concern based on national and regional Service plans,
3. Using information gathered in Steps 1 and 2, develop a Habitat Management Plan,
4. Develop a Habitat and Wildlife Inventory and Monitoring Plan to insure objectives in the Habitat Management Plan are reached.

Special emphasis would also be placed on providing enhanced, and sustainable, opportunities for the six priority, wildlife-dependent public uses defined in the Refuge Improvement Act of 1997 (environmental education, fishing, hunting, interpretation, photography and wildlife observation). The Visitor Services Plan would include a monitoring program to evaluate intensity and potential impact of all the wildlife-dependent public uses on the refuge. Public use activities in general, would be modified in the future if adverse impacts on wildlife or habitat are identified. Public use evaluations, along with wildlife and habitat monitoring programs, would assist the refuge in both assessing the intensity of public use and adapting our management strategies and practices for those uses. The Proposed Action(s) are also summarized under Alternative B in **Table 2-8, Actions and Strategies Matrix for the Oxbow NWR.**

Alternative C

Under this alternative the refuge management strategy would be oriented towards a “hands-off, let nature take its course approach.” We would curtail or forego most, active wildlife and habitat management planning and implementation. Natural succession of habitats would be the selected strategy across the refuge. Additional opportunities for wildlife-dependent recreational activities would be reduced or eliminated within the portions of the refuge located south of Shirley Road, and no facilities would be established in the portion of the refuge located north of Shirley Road.

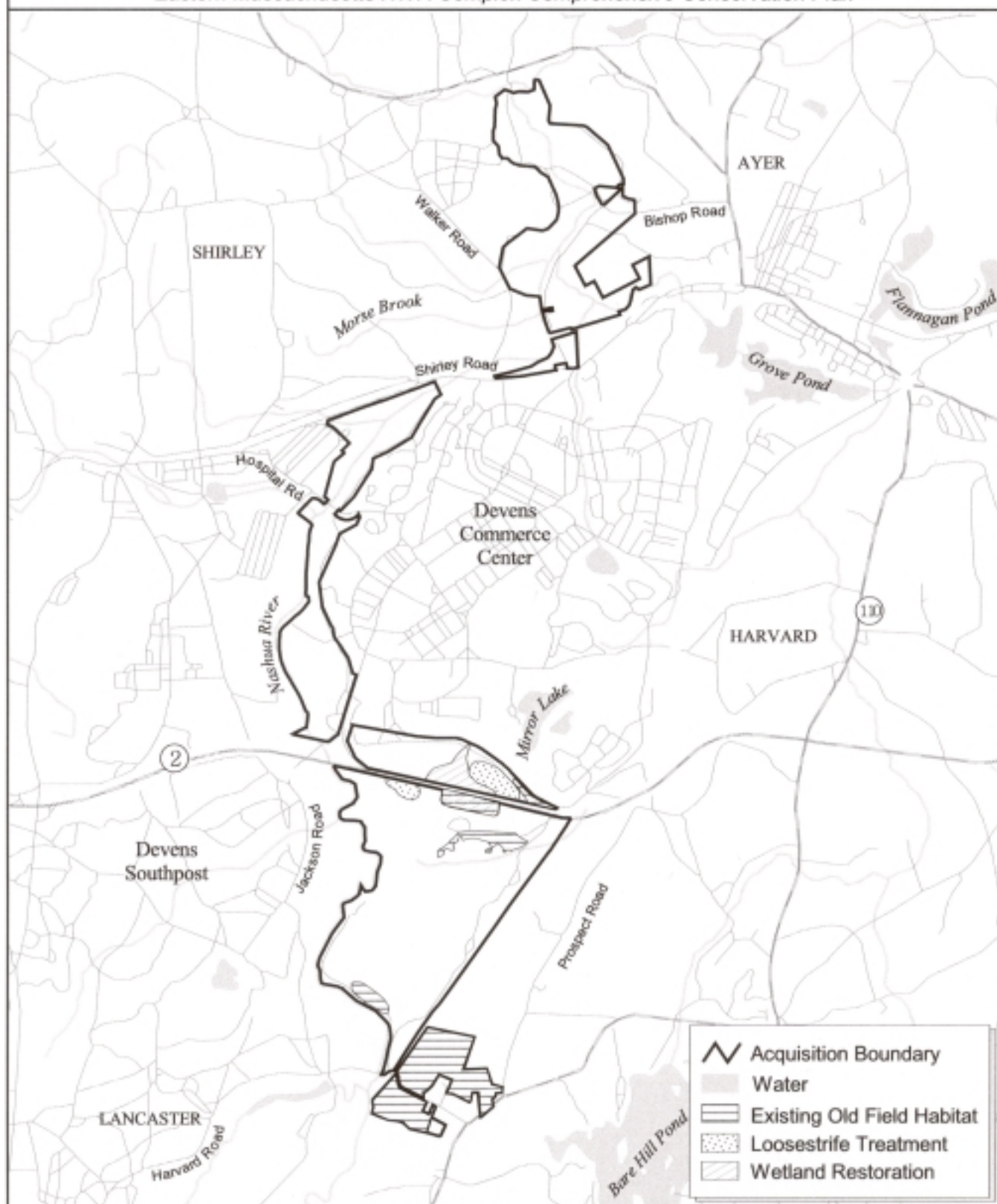
Hunting, fishing and public use plans would be completed. Any necessary, refuge-specific regulations or restrictions would be described in the hunting or fishing plan, published the Federal Register, and disseminated through refuge hunting brochures, news management objectives. No active management would be undertaken except in the event of a threat to property or human health

Alternative A: Current Management

Existing Habitat Management

Oxbow National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2011. This map is for planning purposes only.

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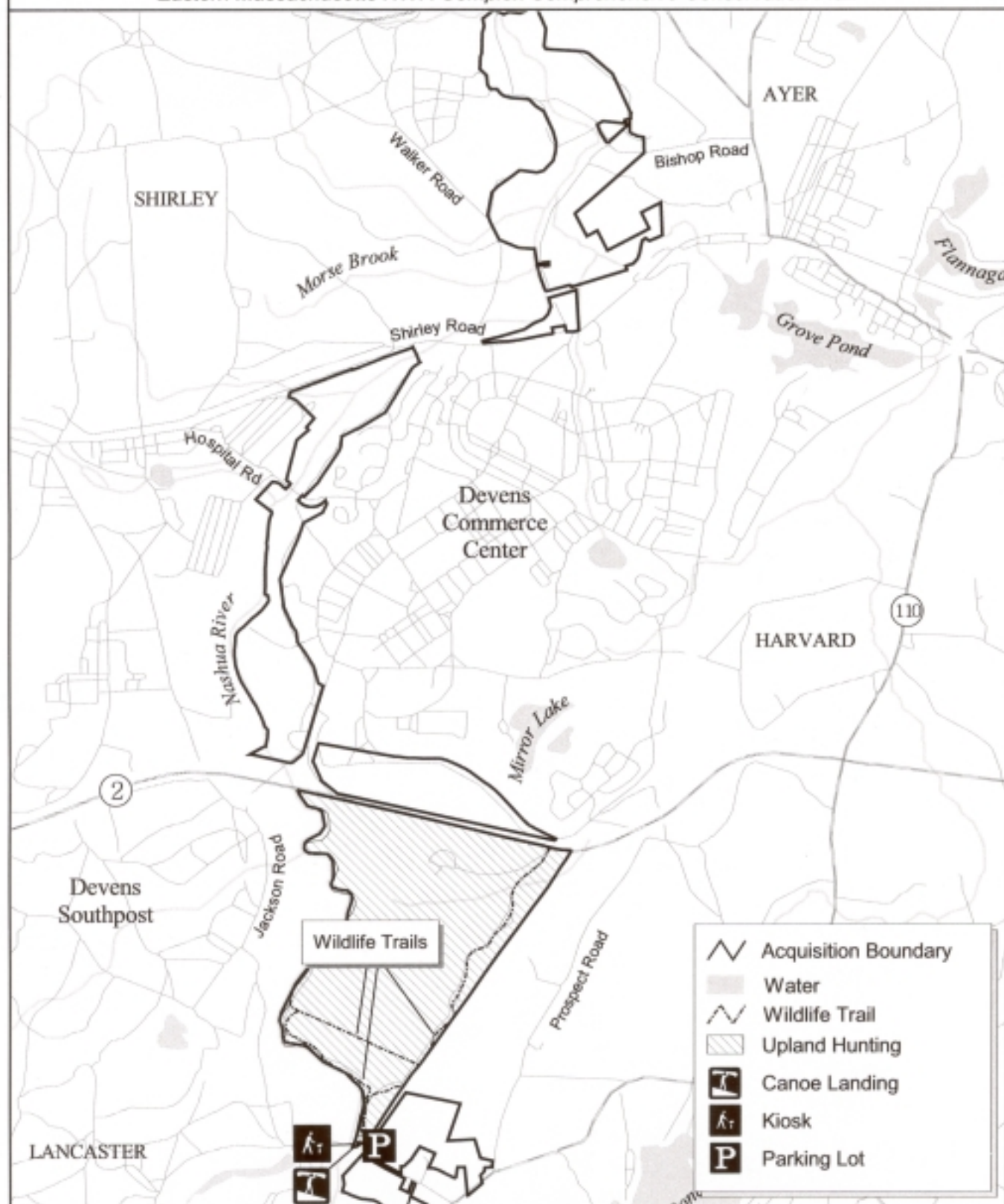


Alternative A: Current Management

Existing Public Use

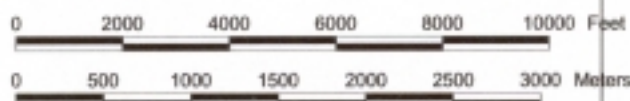
Oxbow National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

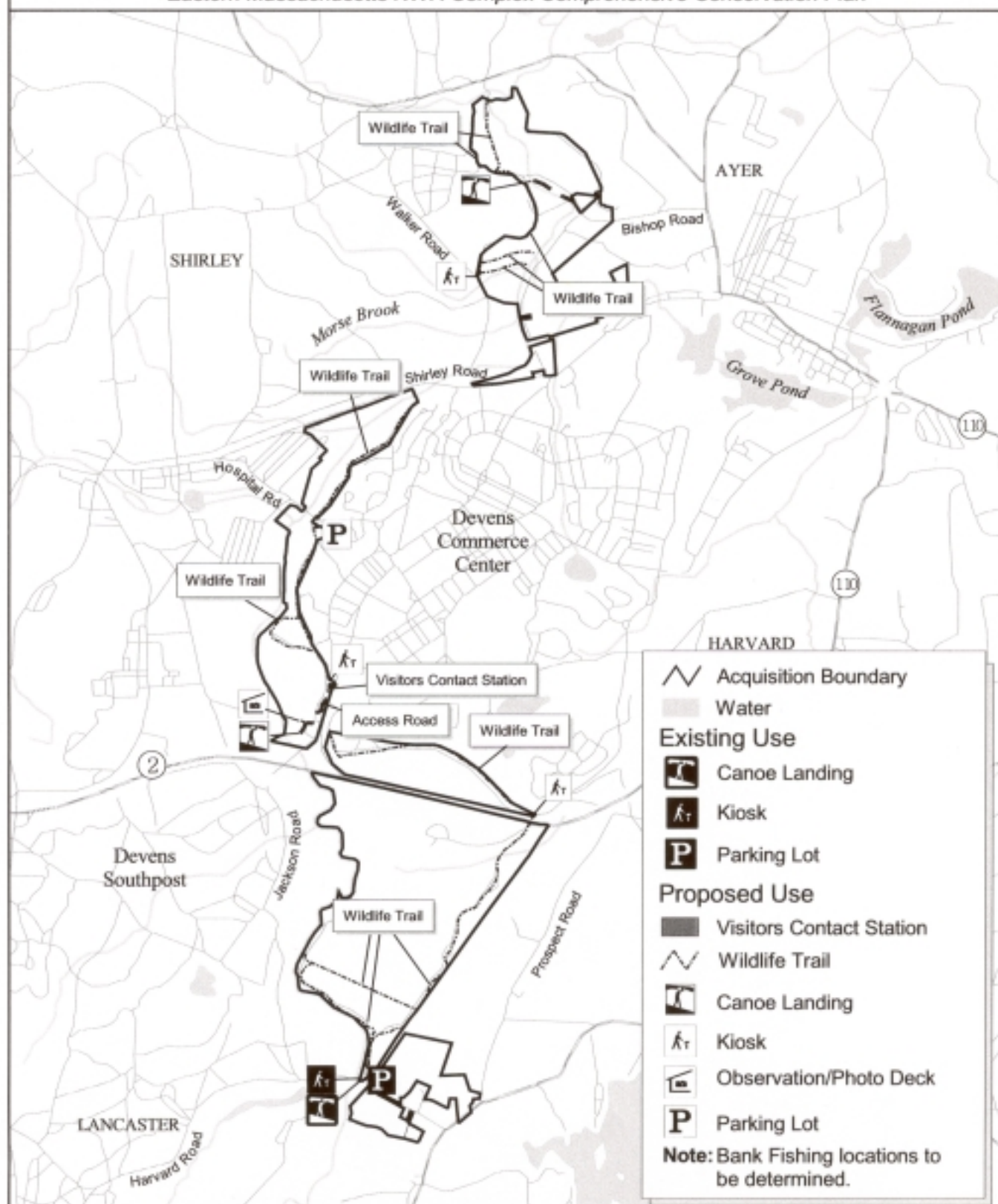


Alternative B: Proposed Action

Proposed Public Use

Oxbow National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

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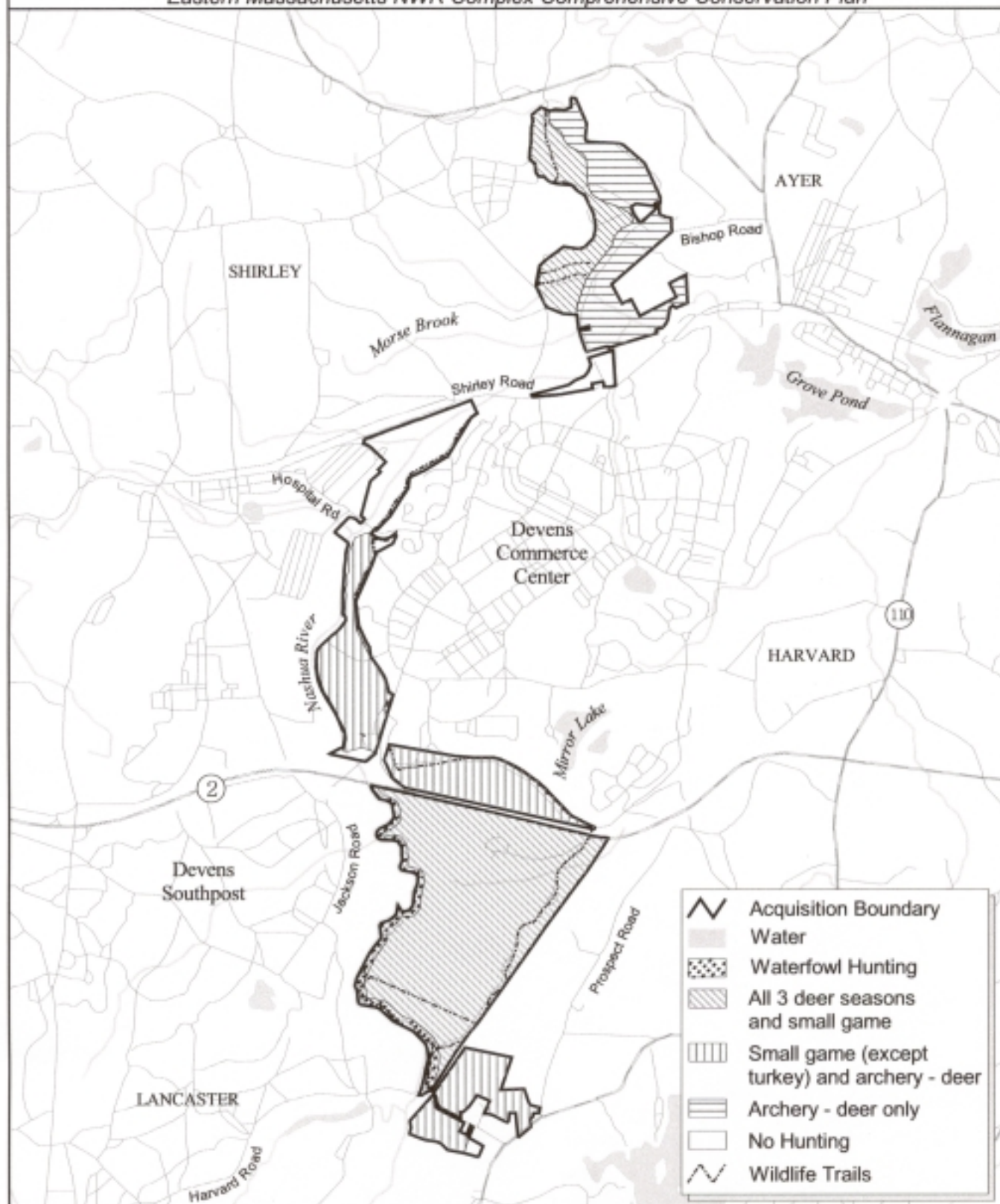


Alternative B: Proposed Action

Proposed Hunting

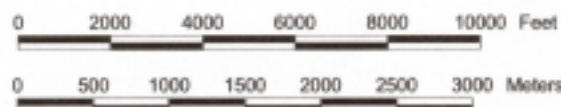
Oxbow National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

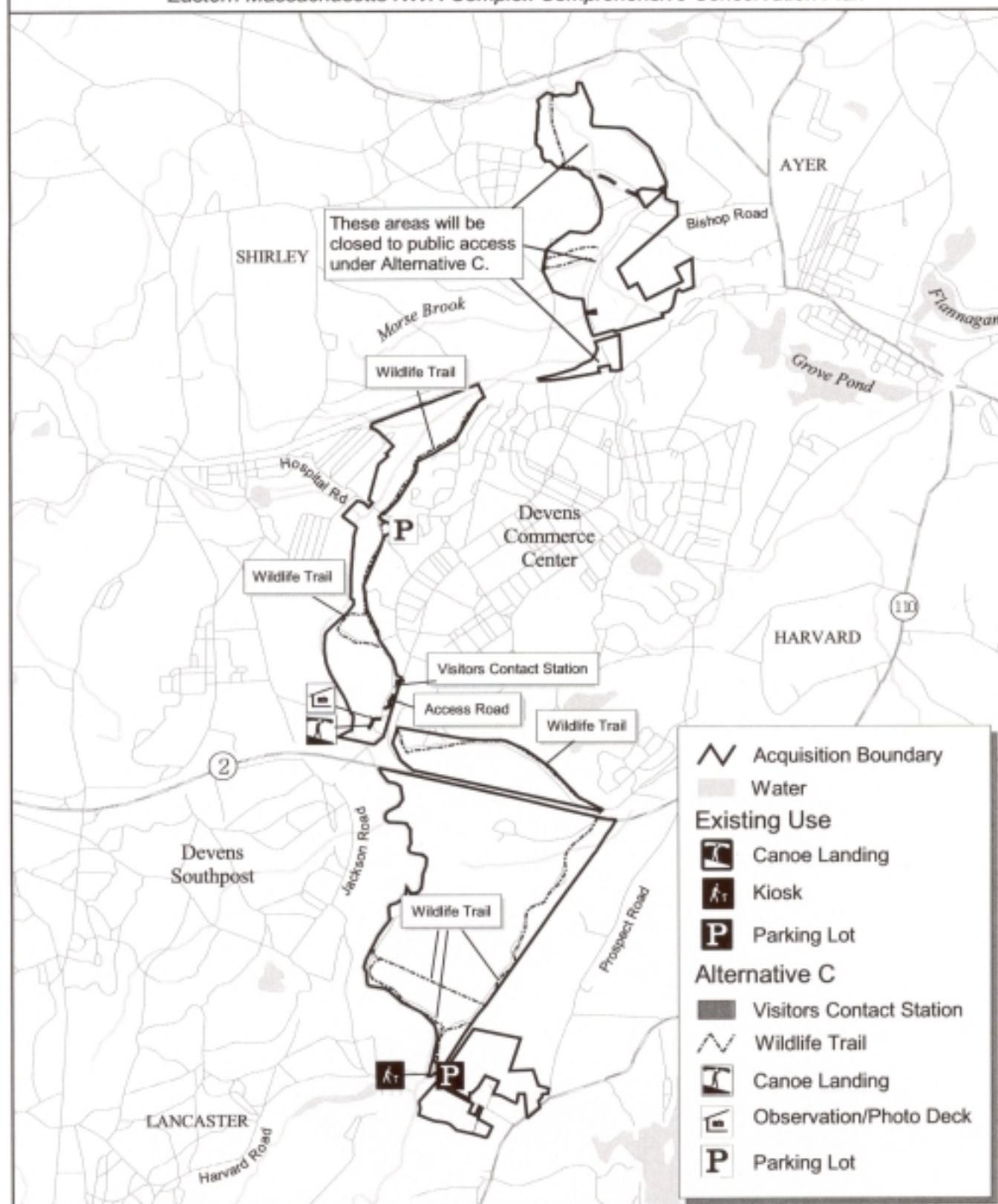


Alternative C

Public Use

Oxbow National Wildlife Refuge

Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

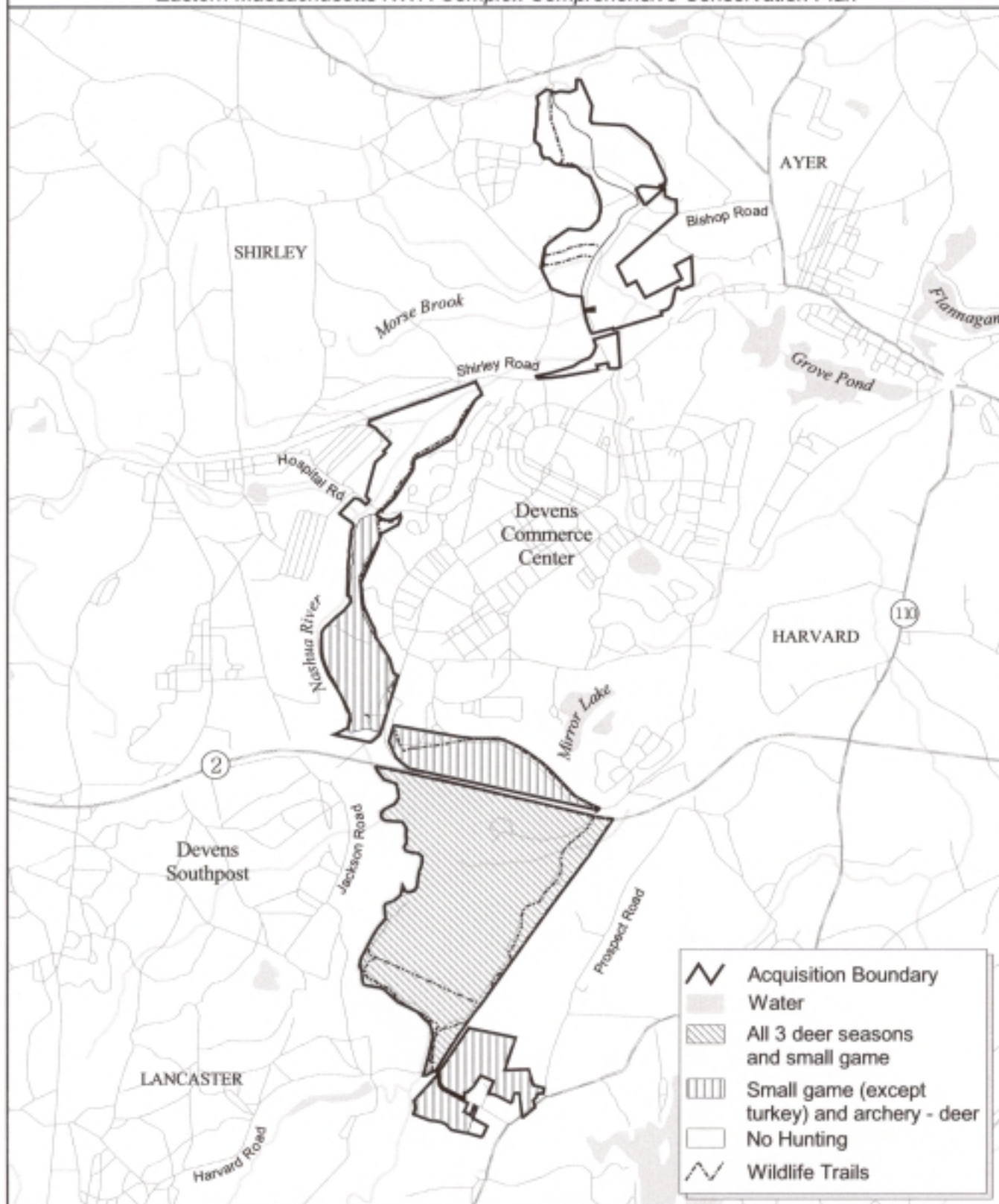
Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

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0 500 1000 1500 2000 2500 3000 Meters



Alternative C Hunting Oxbow National Wildlife Refuge Eastern Massachusetts NWR Complex Comprehensive Conservation Plan



Data Sources:
USGS 1:100,000 roads & hydrology.
USFWS refuge boundaries & other
refuge information.

Map prepared for Eastern Massachusetts National Wildlife
Refuge Complex Comprehensive Conservation Plan,
August 2001. This map is for planning purposes only.

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Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage habitats and wildlife populations?</i>	<p>Conduct baseline population surveys and inventories for</p> <ul style="list-style-type: none"> - woodcock - marsh birds - breeding birds - anuran <p>Blandings turtle monitoring occurs by a partner. Expand Blanding's turtle nesting habitat by removing vegetation and surface organic matter on approximately eight acres that were formerly in this condition. Continue management of 15-20 existing acres</p> <p>Continue partner based contaminants monitoring program</p> <p>Existing information on wildlife populations and habitat is being obtained from partners.</p> <p>Maintain existing old field habitat (approximately 25-30 acres) utilizing fire management techniques or mechanical means.</p> <p>Maintain existing wetland habitat.</p> <p>Restore approximately 30 acres of currently degraded wetlands.</p> <p>Selectively remove existing roads and trails not required for refuge maintenance, visitor use or fire control purposes.</p> <p>Allow the remaining, existing mix of wetland, hardwood and pine forest to mature under natural succession processes.</p>	<p>In addition to Alternative A:</p> <p>Develop inventory list of migratory bird and federally listed threatened and endangered species.</p> <p>Inventory and evaluate population statuses of key, resident vertebrate and invertebrate species, including State listed threatened/ endangered species, deer, small mammals, anuran, and others on the refuge.</p> <p>Identify focus species</p> <p>Develop species management objectives</p> <p>Inventory Refuge habitats, surface hydrology, soils & topography</p> <p>Develop an updated cover type map</p> <p>Develop & implement a Habitat Management Plan and a Habitat and Wildlife Inventory and Monitoring Plan which may utilize mechanical, chemical and fire management techniques to accomplish potential habitat plan recommendations</p> <p>Seek opportunities to develop cooperative management agreements with neighboring conservation agencies, organizations and individuals.</p>	<p>Active management practices would be severely curtailed or eliminated.</p> <p>Planning and monitoring would be limited.</p> <p>Inventory migratory bird and Federal listed threatened and endangered species, resident vertebrate (e.g., deer, small mammals, anuran, etc.) and invertebrate species, including State listed threatened/endangered species, on the refuge.</p> <p>Develop an updated cover type map.</p> <p>Repeat inventory surveys at 10 year intervals to evaluate successional changes.</p>

Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>How would we manage invasive and overabundant species?</i>	<p>A limited program of purple loosestrife control occurs in one wetland area. Host-specific beetles are used to control loosestrife.</p> <p>Monitor known stands of invasive species</p> <p>Continue beaver management program which currently relies primarily on non-lethal methods of control.</p>	<p>In addition to Alternative A:</p> <p>Inventory and document all invasive species locations and pest or overabundant animal species</p> <p>Monitor and evaluate rate of spread of invasive pest or overabundant species</p> <p>Develop and Implement an Integrated Pest Management Plan (IPM) for invasive plant species which utilizes biological, mechanical, chemical and fire management or control techniques.</p> <p>Manage overabundant/invasive animal populations identified in surveys using hunting, trapping and relocation, and lethal controls as may be necessary. Specifically, remove nuisance beaver where other control methods fail and remove territorial exotic mute swans from the refuge.</p> <p>Conduct/participate in experimental control technique research.</p>	<p>Active management practices would be severely curtailed or eliminated.</p> <p>Planning and monitoring would be limited.</p> <p>Inventory and document all invasive species locations and pest or overabundant animal species</p> <p>Monitor and evaluate rate of spread of invasive pest or overabundant species at 10-year intervals</p>
<i>What big and upland game hunting opportunities would we provide?</i>	<p>The refuge is not currently open for deer hunting.</p>	<p>The current Refuge Hunting Plan will be updated, and:</p> <p>Portions of the refuge opened to archery, shotgun and black powder deer hunting. (See text and maps for specifics).</p> <p>Handicapped accessible deer hunting opportunities will be provided.</p> <p>All Public use programs will be monitored for potential impacts on wildlife and habitat, programs will be modified as needed, if adverse impacts are identified</p> <p>Annual fee permits will be required for hunting on the refuge.</p>	<p>Same as Alternative B., except areas of the refuge north of Shirley Road, portions of the refuge would be closed to hunting.</p>

Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What migratory game bird hunting opportunities would we provide?</i>	Portions of the refuge are open to woodcock hunting	<p>Additional portions of the refuge, north of Route 2 will be open for woodcock hunting.</p> <p>Waterfowl hunting would be open on the refuge South of Route 2 on the Nashua River.</p> <p>Annual fee permits will be required for hunting on the refuge.</p>	<p>Same as Alternative B for woodcock hunting, except areas of the refuge north of Shirley Road would not be open for hunting.</p> <p>No waterfowl hunting is proposed under this alternative.</p>
<i>What fishing opportunities would we provide?</i>	The Nashua River is open to boat fishing. Refuge wetland pools are closed to public access. Bank fishing is not allowed.	<p>In addition to Alternative A,</p> <p>River-bank fishing access points will be provided at up to 4 designated areas. These may be closed from time to time to minimize river bank vegetation damage.</p> <p>One or more access points will be made handicapped accessible.</p>	<p>Alternative B, except:</p> <p>only two river-bank fishing locations will be provided.</p> <p>the portions of the refuge north of Shirley Road would remain closed to fishing.</p>
<i>What wildlife observation and photography opportunities would be provided?</i>	<p>The refuge currently provides approximately 2.5 miles of trails, one canoe launch, and a parking area.</p> <p>Snowshoeing and cross country skiing are allowed on the trails currently open for public use.</p>	<p>Same as Alt. A, plus:</p> <p>An additional 5 to 6 miles of hiking trails will be provided on the portion of the refuge north of Route 2.</p> <p>An additional canoe launch, with a parking area will be provided off Jackson Road in the vicinity of Jackson Gate.</p> <p>One additional canoe landing and an additional parking area will be developed within the former North Post portion of the refuge (North of Shirley Road).</p> <p>One wildlife viewing platform and a photography blind will be constructed.</p> <p>Public use programs will be monitored for potential impacts on wildlife and habitat, programs will be modified as needed, if adverse impacts are identified.</p> <p>Evaluate the potential for a foot trail on the Watt farm.</p> <p>An entrance fee would be charged</p>	<p>Same as Alternative B, except:</p> <p>the portions of the refuge located north of Shirley Road will remain closed to public use; and,</p> <p>the parking areas and canoe launches in this portion of the refuge would not be constructed.</p>

Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What environmental education and interpretation opportunities would we provide?</i>	<p>Both on and off-refuge environmental education and interpretive programs are being provided by refuge staff, the Friends group and volunteers.</p> <p>Assistance with teacher workshops is being provided, as requested.</p> <p>An Urban Education program with Worcester school systems has been initiated.</p>	<p>Same as Alternative A plus:</p> <p>Develop a Visitor Services Plan</p> <p>Expand volunteer led interpretive and education programs on the refuge.</p> <p>Expand Urban Education Programs to other regional school systems.</p> <p>Coordinate with area environmental educators to integrate refuge programs into their education programs.</p> <p>Construct three on-site informational kiosk, and implement self-guided interpretive walking and canoeing trails.</p> <p>Review non-Service sponsored uses of the refuge for compatibility. Regulate this uses through use of Special Use Permits, Memoranda or Understanding or Agreement, or Concessions, as appropriate</p>	<p>Alternative B would be modified by eliminating kiosk construction and limiting most non-refuge staff led programs to the portions of the refuge south of Shirley Road.</p> <p>Self-guided foot or canoe trails would be limited to the southern portions of the refuge, below Shirley Road.</p>
<i>How will the Refuge provide outreach to increase the public's awareness of the Refuge?</i>	<p>FWS staff and partners provide off-site, refuge-related presentations to school, clubs, communities, etc. as requested.</p> <p>Continue to develop and build the Refuge Friends group.</p> <p>A quarterly news letter is distributed</p> <p>A refuge Web-site and monthly news releases are used to provide information on refuge management activities and upcoming events.</p>	<p>Same as Alternative A, plus:</p> <p>One or more annual events (such as National Fishing Day, Refuge Week, etc.), which promote wildlife dependent uses and natural resource education will be held on the refuge.</p> <p>Work with partners to construct a visitor center at Jackson Gate entrance.</p> <p>Develop refuge-specific EE curriculum for K-12.</p> <p>Develop annual teacher workshop.</p> <p>Develop program to educate local communities and landowners about existing programs and strategies for resource protection and restoration.</p> <p>Utilize on-going refuge management areas to illustrate beneficial wildlife and habitat practices.</p> <p>Work with partners to place information kiosks with refuge oriented materials at 3 strategic, off-refuge locations.</p>	<p>Same as Alternative B, except on-refuge wildlife and habitat management demonstration areas would essentially be eliminated from the programs.</p>

Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What non-wildlife dependent public uses would be allowed on the Refuge?</i>	Current uses occurring: Picnicking, jogging, dog walking (on leash)	Eliminate non-wildlife dependent uses. Refuge is closed to dog walking and picnicking. Study impacts of jogging	Same as Alternative B
<i>How would we ensure resource protection and visitor safety?</i>	Wildlife and cultural resource law enforcement is provided by one full-time and one co-lateral duty staff shared with other Complex units. Enforce Federal cultural resource protection laws and regulations. Soil disturbance requires cultural resource evaluations and clearance	In addition to Alternative A: Law enforcement staff would be assigned specifically to the Oxbow Refuge. Survey sites proposed for construction of all facilities- roads, trails, buildings, etc. Modify construction as necessary to minimize impacts to cultural resources. Complete an overview survey of cultural resources of the refuge. Develop predictive model for probable archeological and historic sites.	Same as Alternative B, except the refuge-wide archeological survey would be reduced in scope, eliminating studies needed to develop predictive models.
<i>What buildings and facilities would be used or constructed for Refuge operations?</i>	The are no buildings on the refuge at the current time.	Working with partners to obtain funding, a Visitor Contact Station with administrative offices will be constructed at the Jackson Gate entrance to the refuge.	Same as Alternative B.

Table 2-8. Actions and Strategies Matrix, Oxbow National Wildlife Refuge

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
<i>What would be the future staffing needs at Oxbow Refuge?</i>	Current Staffing Level: 1 Refuge Manager 1 Assistant Mgr. (vacant) 1 ORP (vacant) 1 Maintenance Worker (vacant) 1 Admin. Tech (vacant) 1 Park Ranger (LE) (vacant)	In addition to Alternative A: 1 Park Ranger 1 Biological Technician 1 Equipment Operator	In addition to Alternative A: 1 Park Ranger (LE)
	Total FTEs 6	Total FTEs 9	Total FTEs 7



A volunteer leads an environmental education program on the refuge.
USFWS Photo

Environmental Consequences

Environmental Consequences

Introduction

This chapter describes the environmental consequences likely to result from implementation of each alternative management scenario presented in Chapter 2, Alternatives. This section of the EA/CCP forms the scientific and analytical basis for comparisons of the alternatives.

Both indirect and direct effects are predicted for the 15-year planning horizon (as much as can be reasonably expected). Indirect, direct, and cumulative effects beyond 15 years may also be discussed, but are often more speculative in nature.

Most proposed management activities and projects described in Chapter 2 will be analyzed in this chapter. However, the CCP does not contain site plans and exact locations for certain projects, such as the visitor center for Great Meadows. Therefore, additional NEPA compliance and public review may be required once site-specific plans are completed, depending on the nature of the activity.

Certain management activities described in Chapter 2 may qualify as “categorical exclusions” under NEPA provided they meet certain conditions that include not adversely affecting a listed threatened or endangered species. This means they would not require review in an environmental assessment because they are actions which typically do not individually or cumulatively have a significant effect on the human environment. The following activities are considered categorical exclusions in this plan: environmental education and interpretation; wildlife observation and photography research, wildlife inventories (not involving construction), and outreach and partnering efforts. As part of the CCP process, we have identified a range of alternatives to address these issues, however we will not analyze the impacts of these alternatives in this chapter.

In the following discussion, the terms “positive”, “negative”, and “neutral” are used frequently as qualitative measures of how an action would likely affect resources of concern. In some of our discussions below, we are not able to quantify the effect. A “positive effect” means that the actions are predicted to enhance or benefit the resources under consideration and work towards accomplishing goals and objectives over the short or long term. A “negative effect” means that the actions are predicted to be detrimental to a resource over the short or long term, and work against achieving goals and objectives. A “neutral effect” means either a) there would be no discernible effect, positive or negative, on the resources under consideration; or b) predicted positive and negative effects cancel each other out.

We have generally described the impacts on a relatively local or “fine” geographic scale — for example, within national wildlife refuge lands. In actuality, the refuge is not isolated, and the influence of the surrounding landscape on the duration and extent of impacts may not



Red tailed hawk. USFWS

Illustration

be adequately recognized in our text. We may have overstated both positive and negative impacts, considering the geographic context. On the other hand, many of the actions we propose are consistent with other plans identified in Chapter 1, and provide a positive, albeit incremental, contribution to these larger landscape goals. In other words, the refuge may be small, but the actions take a big step on refuge lands towards achieving Refuge System and ecosystem goals.

Each of the three alternatives are analyzed for their impact on air and water quality, wildlife and habitat, and public use and access.

Actions Common to All Action Alternatives

Fees

While administering fees is considered a routine administrative action, we acknowledge that initiating a fee program at Assabet River, Great Meadows and Oxbow refuges may be controversial. Some visitors may disapprove of the fees since many are used to accessing Great Meadows and Oxbow refuges without fees. Some people who currently use these refuges may choose not to return because of the fees and others, who have not visited before may choose not to visit because of the fees.

A recent article evaluating the Demonstration Fee Program at 14 national wildlife refuges provides some idea of what impacts can be expected from a fee program. On those refuges surveyed, only 8% of the visitors said that they would change their future plans to visit the refuge because of fees charged. Hunters and anglers were more likely to be displaced by fees and change their plans while those coming to refuges for wildlife photography and observation were less likely. Less than 13% of those surveyed chose not to visit at all, or were displaced, because of the fees. The study suggests that individuals in lower income brackets are more likely to be displaced by fees than others. Those who understood how fees would be used and their importance to maintaining quality services and enhancing economic efficiency on refuges were more likely to agree with fees (Taylor et. al 2002). Because education is such an important part of any fee program we intend to provide information to all our users about the fee program. Information distributed would explain that fees promote equity by charging those who actually use the refuge, enhance programs by generating revenue that can be used on the refuge and help recover administrative costs, especially in the case of the hunting fees, where there are specific administrative costs involved. The fees would also fund additional programs and facilities, providing new opportunities for those who use the refuges. For more information about how the fee program would be administered, see Chapter 2, Actions Common to All Action Alternatives.

Table 4-1. Summary of Environmental Consequences

	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
Water Quality/ Hydrology	<p>Positive impact by protecting land, use of beaver deceivers and periodic ditching</p> <p>Possible minimal negative impacts to nontarget organisms from pesticides and herbicides used to control invasive and exotic species</p>	Same as Alternative A	Negative impacts to hydrology and habitat from no control of beaver (nonlethal or lethal)
Geology/ Topography/ Soils	<p>Overall, no impact to local geology, topography or soils</p> <p>Temporary disturbance may occur during habitat management practices such as disking and plowing</p> <p>Small scale permanent alteration will occur at locations for administrative, maintenance, and visitor facilities</p>	Same as Alternative A	<p>Same as Alternative A, except minimized impacts to soil due to reduced habitat management and public use (Assabet River and Oxbow refuges)</p> <p>Same as Alternative A at Great Meadows Refuge</p>
Air Quality	No impact on air quality. All three refuges have attainment status required by the Clean Air Act	Same as Alternative A, except short term negligible impacts from small scale prescribed burning (See Chapter 2, Fire Management EA)	Same as Alternative A
Habitat and Wildlife Populations	<p>Positive impacts to wetland habitats from restoration of natural hydrology and native species</p> <p>Positive impact on grassland habitat and species from managing 70 acres</p> <p>Positive impacts on all other habitats from land conservation</p>	Same as Alternative A, except positive impact to the sustainability of habitat and wildlife on the refuges from additional surveying and planning	<p>Negative impacts to wetland habitats that are not restored</p> <p>Negative impact to grasslands and grassland species as these lands succeed to shrub and forest</p> <p>Positive affect on forest birds as lands succeed to forest</p>

Table 4-1. Summary of Environmental Consequences

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
Habitat and Wildlife Populations (Continued)	Invasive Species Negative impact and loss of native habitat and wildlife that use that habitat from limited invasive species control	Positive impacts to all habitat types from the removal of invasive and exotic species, including purple loosestrife, common reed and water chestnut Negligible short term impacts to wildlife and native species from proposed burning and pesticide use (see Chapter 2, Fire Management EA) Positive impact to wetland habitat and native wildlife from the removal of aggressive and territorial mute swans	Negative impact to native habitat and wildlife from limited invasive species control program
Hunting	Deer herd continues to increase, resulting in potential negative impact on plant composition and species richness and abundance of herbaceous and woody vegetation understory available for migratory birds	Potential positive impact on plant composition and species richness from deer hunting Potential negative impacts to habitat from trampling of vegetation, creation of unauthorized trails by hunters and subsequent erosion, littering and vandalism Negligible impacts to non-target fauna from hunters	Same as Alternative B, except fewer deer would likely be removed under this alternative, except at Great Meadows where the hunt program would be expanded under this alternative
Fishing	No impacts to fish or habitat at Assabet River Refuge, where fishing is closed Negligible impacts to fish and habitat at Great Meadows and Oxbow where limited fishing is allowed	Negligible impacts to fish and habitat (at all three refuges) by opening or expanding fishing opportunities. Individual fish may die (even in catch and release areas) but no real affect on the overall population is anticipated Potential negative impacts to habitat from trampling of vegetation, creation of unauthorized trails and subsequent erosion, littering and vandalism (impacts to habitat will be minimal in areas where access points designated and fishing platforms are provided)	Same as Alternative B

Table 4-1. Summary of Environmental Consequences

	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
Public Use	<p>Negative impact on public use opportunities due to closure of Assabet River Refuge</p> <p>Positive impact on public use at Great Meadows and Oxbow where refuges are open to wildlife observation and photography, environmental education and interpretation</p>	<p>Positive impacts to public use opportunities at Assabet River Refuge- refuge open to all priority public uses and uses expanded at Great Meadows and Oxbow refuges</p> <p>Potential positive impact on appreciation of public land by offering additional outreach and public use opportunities</p>	<p>Same as Alternative B, except fewer opportunities</p> <p>Same as Alternative B at Great Meadows, except increased programs beyond Alternative B for wildlife observation and photography, environmental education and interpretation and fishing and hunting</p>
Hunting (for impacts of this activity on habitat and wildlife, see previous section)	<p>No hunting opportunities occur at Assabet River and Great Meadows</p> <p>Negative interactions between humans and deer occur (road kill, Lyme disease, damage to residential neighborhoods and agricultural crops)</p> <p>Positive impacts to hunters at Oxbow Refuge- hunting opportunities provided</p>	<p>Positive impact on hunters by offering hunting opportunities</p> <p>Potential negative interactions between non-hunters and hunters during hunting seasons</p>	<p>Same as Alternative B at Assabet River and Oxbow Refuges, except fewer opportunities</p> <p>Same as Alternative B for Great Meadows, except shotgun deer opportunities offered, potentially creating additional negative interactions between non-hunters and hunters</p>
Fishing (for impacts of this activity on habitat and wildlife, see previous section)	<p>No fishing opportunities occur at Assabet River Refuge</p> <p>Positive impacts on fishing opportunities at Great Meadows and Oxbow by offering river fishing</p>	<p>Positive impact on fishermen/women by offering fishing opportunities on Puffer Pond at Assabet River Refuge and other new opportunities at Oxbow Refuge</p> <p>Same as Alternative A for Great Meadows</p>	<p>Same as Alternative B, except fewer opportunities for Assabet and Oxbow refuges</p> <p>Same as Alternative A for Great Meadows</p>
Non-wildlife dependent recreational uses (Great Meadows and Oxbow refuges, Assabet River Refuge would not be open to these uses under any alternative)	<p>Dog walking and picnicking would remain open at Great Meadows and Oxbow despite contradicting refuge purposes</p> <p>Negative impacts from dogs disturbing or killing wildlife.</p> <p>Negative impacts from feces left on trail, impacting aesthetic value</p> <p>Negative impacts to bird observers and photographers (disrupting wildlife) from unleashed dogs</p>	<p>Positive impacts on priority public uses by eliminating non-wildlife dependent uses which interfere with these uses and disturb wildlife and habitat</p> <p>Positive impact on nesting birds and resident flora and fauna from eliminating dog walking</p> <p>Positive impact on wildlife by eliminating attraction of nuisance wildlife to human food sources from eliminating picnicking</p> <p>Negative impacts to users who utilize the refuge for non-wildlife dependent uses</p>	<p>Same as Alternative B</p>

Table 4-1. Summary of Environmental Consequences

Issue	Alternative A Current Management	Alternative B Service's Proposed Action	Alternative C
Resource Protection and Visitor Safety	<p>Safety maximized since the refuge is closed to the public at Assabet River</p> <p>Negative impacts at all refuges from limited enforcement</p>	<p>Positive impact on resources and visitor safety from providing consistent enforcement and outreach and additional staff on refuges</p>	<p>Same as Alternative B</p>
Cultural Resources	<p>Cultural resource reviews occur when required</p>	<p>Positive impacts to cultural resources by completing a comprehensive cultural resource review on all refuges</p>	<p>Same as Alternative A</p>
Socioeconomic	<p>Negligible impacts from habitat management and public use on the refuges</p> <p>Positive impact from land conservation in local towns</p>	<p>Same as Alternative A. Positive impacts to towns from potential increase in visitors</p>	<p>Same as Alternative B</p>



The Concord impoundments at Great Meadows Refuge offer visitors an opportunity to view birds that use the Complex. *USFWS Photo*

Coordination With Others

- Introduction
- Public Involvement Summary
- Coordination with State and Other Partners
- Mailings
- Federal Register Notices
- **Core Planning Team**
- **Other Assistance**
- **Addresses**

Core Planning Team

Tim Prior, Deputy Project Leader, Eastern Massachusetts Complex

Education: BS Biology
University of Hawaii Graduate School of Oceanography
Experience: 2 years, Biology Teacher
5 years, State of Hawaii, Environmental Specialist
16 years, Department of the Army
11 years, USFWS
Phone: (978) 443-4661
Email: tim_prior@fws.gov

Stephanie Koch, Wildlife Biologist, Eastern Massachusetts Complex

Education: BS Wildlife Biology
Experience: 9 years, USFWS
Phone: (978) 443-4661
Email: stephanie_koch@fws.gov

Sharon Fish Marino, Refuge Manager, Monomoy National Wildlife Refuge

Education: BS Wildlife Biology
MS Wildlife Ecology
Experience: 6 years, USFWS
Phone: (508) 945-0594
Email: sharon_marino@fws.gov

Carl Melberg, Land Acquisition Planner

Education: BS Wildlife Biology
Experience: 3 years Department of Defense Mapping Agency
3 years Massachusetts Highway Department
6 years Army Corps of Engineers
13 years, USFWS
Phone: (413) 253-8521
Email: carl_melberg@fws.gov

Lindsay Krey, Assistant Planner (Team Leader)

Education: BS Natural Resources
Experience: 4 years, USFWS
Phone: (413) 253-8556
Email: lindsay_krey@fws.gov

Bud Oliveira, Deputy Chief of the National Wildlife Refuge System, Region 4, Former Project Leader, Eastern Massachusetts Complex

Education: BS Wildlife Management
Experience: 20 years, USFWS
Phone: (978) 443-4661
Email: bud_oliveira@fws.gov



Berries. *Photo by Joan Rolfe*

**Pamela Hess, Appalachian Mountain Club, Former Deputy
Project Leader, Eastern Massachusetts National
Wildlife Refuge Complex**

Education: BS Wildlife Biology
MS Natural Resources Environmental Education and
Interpretation
Experience: 9 years, USFWS
Phone: (978) 443-4661
Email: pamela_hess@fws.gov

Other Assistance from Partners

**Chuck Bell, District Manager Northeast District, Division of
Fisheries and Wildlife,
Commonwealth of Massachusetts Fish and Wildlife**
Review and comment for the State

Debbie Dineen, Natural Resources, Town of Sudbury
Provided biological information regarding Assabet River Refuge

Curt Laffin, Planning Consultant
Wrote Environmental Consequences

**Jack Lash, Planning and Ecology Director, Department of
Environmental Management, Commonwealth of Massachusetts**
Review and comment for the State

**Tom Poole, Natural Resource Manager, Army at Devens
Reserve Forces Training Area**
Provided biological information regarding Assabet River Refuge

**Bill Woytek, Division of Fisheries and Wildlife, Commonwealth
of Massachusetts**
Information regarding deer populations

Bruce Flaig and Marijke Holtrop
*Generously allowed the refuge to use their photographs, many of
which were used in this plan*

Other Service Assistance

Nicole Allison, Former Wildlife Biologist, Refuges and Wildlife
Drafted affected environment for Assabet River Refuge

**William Archambault, Fisheries Supervisor South, Former
Regional NEPA Coordinator**
Reviewed document for NEPA compliance

Melissa Brewer, Former Fisheries Biologist
*Research and collection of aquatic information for affected
environment*

John Eaton, Cartographer
Created maps for alternatives

Andrew French, Realty Officer
Provided guidance on land protection strategies

Thomas Bonetti- Refuge Planner
Former Team Leader for this project.

Victoria Jacobson, Archeologist
Drafted the cultural resource sections of the affected environment

Rick Jorgensen, Realty Specialist
Provided guidance regarding land protection planning

Wendy Lilly-Hanson, Former Wildlife Biologist, Great Meadows National Wildlife Refuge
Assisted with affected environment chapter for Great Meadows Refuge

Janet Kennedy - Refuge Manager Parker River National Wildlife Refuge (Former Deputy Refuge Manager for Eastern Massachusetts National Wildlife Refuge Complex)
Assisted with early development of the plan

Deborah Long - Deputy Refuge Manager Forsythe National Wildlife Refuge, Former Monomoy Refuge Manager
Former core team member

Lisa Plagge, Former Bio-technician, Great Meadows, Oxbow, and Assabet NWRs
Species list and information

Pamela Rooney- Engineering Supervisor, Former Planning Team Leader
Lead the project for the first two years.

Rick Schauffler, Wildlife Biologist and Cartographer
Created and edited all land protection planning maps

Janith Taylor- Regional Biologist, Refuges and Wildlife
Review and comment on biology

Sharon Ware - Refuge Manager Sachuest Point National Wildlife Refuge (Former Refuge Manager at Monomoy National Wildlife Refuge)
Assisted with early development of the plan

Mike Amaral, Senior Endangered Species Specialist
Provided information and guidance Northern red-bellied cooter management and Karner blue butterfly



Prairie warbler. *Photo by Bruce Flaig*

Addresses

Northeast Regional Office
U.S. Fish and Wildlife Service
National Wildlife Refuge System
300 Westgate Center Dr.
Hadley, MA 01035

Eastern Massachusetts National Wildlife Refuge Complex
Headquarters
73 Weir Hill Road
Sudbury, MA 01776